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CHILD BEHAVIOR AND DEVELOPMENT

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John F. Dashiell was Consulting Editor of this series from its inception in 1931 until January 1, 1950.

CHILD BEHAVIOR AND DEVELOPMENT

A Course of Representative Studies

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Preface

This volume aims to provide foundation material for work in child psychology by presenting reports of selected studies prepared for the use of college students. The reports are not essays *about* research. Each of them is an account of the procedures, results, and conclusions of a particular investigation. Their purpose is to represent not only the products but also the processes of research.

It might be argued that only those who are preparing for professional work in psychology are in a position to profit from a knowledge of the concrete things psychologists do to get their results. Against this view there is a growing belief that all students, whatever the present level or purpose of their training, will gain at least as much from a familiarity with the methods and tools of a science as from a knowledge of research findings. There is also the fact that in any case a real grasp of the findings requires some understanding of the procedures behind them.

The role of the editors in the undertaking has been restricted in two ways: The *selection* of the studies is based on judgments by a number of experts; the *reporting* is the work of the investigators who conducted the studies. The editors have hoped that these measures would ensure the volume against choice of material in the interests of a particular viewpoint, misleading editorial modification, deletion of important details, oversimplification, and other shortcomings to which it would have been liable if the whole task of selection and preparation were to have been less widely distributed.

In canvassing expert opinion, inquiries were sent to 110 members of the Society for Research in Child Development. Each member was asked to list the six studies of child behavior and development which in his judgment it would be most desirable to present in a book of basic reading material for college students. Nominations representing most, but not all, of the principal areas of research were received from 52 persons. Within each area, studies were selected according to frequency of nomination. In a number of instances, several studies of the same problem were nominated with approximately equal frequency. When this occurred, spatial limitations compelled us to eliminate some investigations, many of them certainly equal in merit and significance to those in the final selection. Mainly for the purpose of representing areas of research that had not been tapped by the nominations, considerable exercise of the editors' judgment proved to be necessary, and in this they have not been without temerity—as the reader may infer from the inclusion of three of their own studies.

The nominations of the experts called for the inclusion of studies by European investigators. Unfortunately, difficulties of communication resulting from the war have made this impossible.

The editors have hoped to pack a fairly adequate reserve shelf between the covers of one volume. If that objective has been realized, the book may find use as central rather than collateral reading in courses on child psychology or educational psychology. It would then save for the instructor the role of sketching background, giving points of view, and knitting together the whole field. By way of granting to the instructor a free hand in the organization of the material, the editors have not undertaken to classify the contents. Selected bibliographies covering the field of each study have been included for the guidance of students who may wish to study further.

The project has been conceived from the first with a view to the difficult problem of distribution in science, the task of extending scientific attitudes, procedures, and findings beyond the limited range of those engaged in research. An increasing inclination on the part of scientists to do something about this problem is attested in many ways. We have witnessed an increase in the number of books for laymen by scientists, the establishment of the Science Service Press Bureau, the sponsoring of lectureships by scientific associations, and the organization of foundations to control the exploitation of scientific discoveries. However, for the most part, investigators continue to leave to middlemen the task of bridging the gap between the laboratory and the public. This can easily result in misunderstanding and misrepresentation. It has seemed to the editors that scientists might themselves contribute toward a solution of the problem by reporting their own work to a wider circle than is reached by technical publications. The present volume is an effort in this direction. It has been planned as an experiment in making firsthand reports of scientific research intellectually and physically accessible to laymen.

The work on every phase of this project has been cooperative. Thanks and credit are due to many persons: to those members of the Society for Research in Child Development who aided in the selection of the contents; to the contributors who did much onerous work in revising old manuscripts or preparing new ones; to the American Council on Education, Division on Child Development, for providing one of the editors an opportunity to work on the project during its early stages; to Professor Daniel A. Prescott for help and encouragement.

Many individuals and publishers have granted permission for quoting or adapting material and for reproducing tables and figures. These are acknowledged in the text.

ROGER G. BARKER,
JACOB S. KOUNIN,
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STANFORD UNIVERSITY,
UNIVERSITY OF ILLINOIS,
CARLETON COLLEGE,
March, 1943.

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CHILD BEHAVIOR AND DEVELOPMENT

CHAPTER I

RESEARCH IN CHILD PSYCHOLOGY: HISTORY AND PROSPECT

LAWRENCE K. FRANK

Introductory Statement

As the editors have explained in their Preface, this volume differs in content, organization, and purpose from previous textbooks and handbooks. It may be pointed out as a further characterization of the volume that it marks a significant phase in the field of child behavior and development, since it indicates that this relatively new scientific endeavor has reached a certain stage of maturity.

To present an adequate and valid history of child psychology would call for a detailed and fully documented record far beyond the scope of this modest sketch, which attempts only to offer a perspective from which to view the varied studies that follow.

The earlier studies of child behavior were largely the work of a few isolated individuals who, with little precedent and no established procedures, began to observe and record the development of single children. These first biographies, however carefully prepared, might be called "naturalistic studies" like the early work of the naturalists who observed the outstanding events in the march of the seasons. It seems fair to say that the pioneer students of child behavior approached their subjects directly and more or less naïvely, with little concern about methods, untroubled by any perplexities over the question of whether or not their work was strictly scientific.

From these beginnings to the present there has been a steadily growing self-consciousness and self-criticism that, as suggested earlier, may now be said to have reached a definite stage of sophistication, of which this book may be cited as a significant indicator.

It is apparent that the studies in child psychology, like all other scientific endeavors, reflect the major preoccupations and methodological predilections that were present during the early course of its development. Almost of necessity, the students in any new discipline must seek guidance from the studies that have been longer organized and must acknowledge the prestige of and seek recognition among the members of the scientific guilds to which they are allied. Thus it appears that when the more systematic attempts to study child behavior and child development began in the second decade of this century, they were focused primarily upon the study of specific traits and capacities. They dealt with professional problems of psychology such as the relation between two variables and utilized the then current procedures as methods of investigation.

The predominant search for methods that could be considered purely quantitative and objective has been one of the outstanding characteristics in American psychology. While it would appear that one of the major influences of this endeavor came from the pioneering work of Binet and Simon, the native talents and interests of American psychologists have found in the development of quantitative procedures a field for their ingenuity and an outlet for their strong determination to give psychology something more than a verbal and philosophic content. To create an instrument that would make possible the objective, quantitative measurement of activities, not only in the overt performance of specific tasks but even in the exercise of intelligence, soon became the chief ambition of investigators.

Where it was difficult, if not impossible, to construct a measuring instrument of the usual pattern, efforts were bent upon establishing developmental sequences and constructing scales along which the observations on any single child could find an appropriate location. This could then be interpreted as an indication, if not as a measurement, of where, in orderly progression, the child stood at the moment of scrutiny.

The skill and ingenuity that have been displayed in the construction and refinement of these instruments should be emphasized because at times it appeared that the interest of child psychologists was so absorbed in this occupation that it precluded much concern for or curiosity about the children themselves. It may be said with no implications of criticism or disrespect that this lack of interest in children and the almost complete absorption in calculations and the derivation of formulas in connection with the construction and refinement of tests threatened to arrest the further development of child psychology, insofar as other interests and problems not susceptible to psychometric formulation and approach were neglected. At the height of this activity child psychologists seemed bent upon "substituting statistics for insights" and ignoring, if not denying, other aspects of child behavior that could not be brought within the rigid prescriptions of a standardized test.

At this point it may not be violating the canons of serious scientific writing to illustrate the situation that arose in child psychology by relating the story of the policeman who, on following his beat one night, found a man busily searching the ground at the foot of a street light. The policeman asked, "Lost something?"

The individual, obviously somewhat intoxicated, remarked, "Yep."

"What have you lost?" asked the policeman.

"Watch."

The policeman also got down on his hands and knees and searched patiently in the circle of illuminated ground around which the man had been moving. After some minutes of this the policeman asked, "Are you sure you lost it here?"

"Nope."

"Where did you lose it?"

"Up the alley."

"Well why don't you look there?"

"No light!"

This story has the merit of indicating that in nearly all our scientific endeavors we tend not primarily to ask questions and to seek answers in terms of what is most important or urgently needed, but rather to pose the problems for which we have developed methods. In consequence the development of science is characterized by recurrent periods of intense preoccupation with certain problems and the refinement of methods that are then favored; almost the whole endeavor of the discipline might be said to be arrested at this point. This seemed to be the situation in the field of child psychology where only those questions were likely to be asked and studied for which the well-established methodology of psychometrics or of laboratory experiments could be applied.

It is interesting to note how the increasing prestige of the statistical methods not only operated to condition the problems which students selected for study but to a great extent necessitated the search for larger samples of child population from which could be derived the arrays of data that were necessary for this method. In turn the very labor and cost of examining or measuring these large populations tended to limit the investigations to one or two aspects, or what are called "variables." In consequence the data thus obtained were often extensive and yielded results that were statistically significant but also gave rise to perplexities and anomalies which could rarely, if ever, be resolved because so little was known about the child subjects beyond sex and chronological age and the one or two measurements that had been obtained.*

Psychology, like the other disciplines, came to the study of children with certain professional interests and well-recognized problems such as learning, perception, reflex activities, and conditioning, etc. These problems were studied by using children as more or less convenient and satisfactory laboratory subjects in whom the investigator was interested only to the extent that they provided data for his specific problem. Thus psychologists and investigators in other disciplines were at one time utilizing the same group of child subjects with little or no interest in each other's work or attempt to utilize these diverse data for a better understanding of the children or the specific problems each was investigating. This use of children for specific investigations by psychologists and others is emphasized in this discussion because it offers a useful contrast to the rather slowly emerging realization of the problem of child development as a scientifically valid and humanly significant enterprise, wherein the interest is focused upon the attempt to understand the processes of growth, development, and maturation in children as distinct from a concern with the purely professional problems of the contributing disciplines.†

While the study of child behavior in its various manifestations was being pursued by psychologists, as described earlier, two other lines of activity were slowly but cumulatively developing that would later bear significantly upon the field of child study. One of these was the interest of anatomists and pediatricians in problems of physical growth; the other was the concern of workers in child guidance clinics with the behavior problems presented by individual children.

The Contributions from Anatomy and Pediatrics

The anatomists and pediatricians began to study and record various aspects of physical growth and development. They started with an interest in the development of norms, but were progressively influenced by the frequency of variation in their material and came to what was at first a reluctant admission that children of the same chronological age differed to an almost astonishing degree in some of their bodily dimensions and their capacities for physical performance. It is difficult at this time to give any definite description of just how and when this realization emerged and began to trouble those who were examining, measuring, and otherwise recording transformations in bodily contours and proportions. It seems fair to say, however, that in this phase of child development arose the growing suspicion of the validity of these norms however conscientiously and adequately they were computed in accordance with the prescribed statistical techniques. Unlike the psychometric experts who worked with the impersonal and wholly detached records of children's performances and were rarely exposed to actual contact with the living children involved, the students of physical development not only collected their own data by direct contact and examination of the living child, but also had the opportunity of constructing these norms and then seeing in compelling fashion the discrepancy between the statistical constructs and the living material to which they were expected to apply.

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* *E.g.*, Shuttleworth resolved some of the confusion about height and growth in girls by showing how age at menarche helped to interpret more clearly the height, chronological age, and sex data of the Harvard Growth Study (16).

† It is of interest to note how much of child psychology derives from doctoral studies which, of necessity, were limited in time and scope to what a graduate student could attempt in two or three years of work; these produced findings on discrete aspects of child behavior that are difficult to add up or integrate into any comprehensive picture of children's activity or the ongoing process of growth and development in which many events occur simultaneously but at different rates.

The skepticism or uneasiness that began to arise was brought to a sharp focus and dramatically expressed by the then unprecedented and seemingly outrageous proposal made by T. Wingate Todd in the early twenties that students of physical development might wisely shift their concern from measurements to an examination of changing textures, configural patterns, and other evidences of advancing development and maturation. This proposal and some of the preceding work by other students in this field aroused considerable opposition and resentful criticism from those who were convinced that only through ever more rigorous and precise quantitative methods could the study of child development attain any scientific respectability. The issue thus presented was, however, not to be settled by the usual polemics and apologetics; soon it became expedient if not necessary for child psychologists to invite participation of the somatic group or at least to utilize some of their techniques and procedures, which revealed, as notably in X rays, those differences in texture and pattern that could not be effectively quantified but could be ordered in a sequence of maturation.

The Influence of Child Guidance Clinics

Almost concurrently another enterprise in the field of child study was emerging and assuming increasing proportions and scope in the form of child guidance clinics. Here the problem was that of discrete individual children whose misconduct or obvious inability to meet the accepted norms of performance in schools or communities brought them into notice as difficult and so-called "problem cases." The psychiatrist, as the clinically trained diagnostician and therapist for personality difficulties and emotional disorders, was called upon to examine these children and to offer some help to distracted parents and harassed teachers and the even more perplexed police and courts in the care, rearing, and, above all, the regulation of these troublesome children. The psychiatrist brought to this endeavor his clinical procedures, which have certain characteristics that are significant for this discussion.

In the first place, the clinical approach explicitly recognizes and affirms the unique individuality of each patient. Secondly, it asserts with all emphasis, backed by the sanction of many generations of medical practice, that the individual has had a life history, the understanding of which is a prerequisite to any attempt at diagnosing, *i.e.*, identifying his difficulties or disorders. Third, the clinical approach involves not only a diagnosis based upon as complete a history as time and circumstances will permit, but also a prognosis in the sense of a forecast of how the patient will fare in either the immediate or longer term future as directed by the therapeutic procedure which the physician offers. In the practice of medicine, perhaps more than in any other profession, we see an art which endeavors to utilize and apply scientific findings always in a unique synthesis of such scientific knowledge and procedures as is deemed appropriate for the individual needing medical care. More specifically the clinical method may be described as essentially *relative*, in the sense that it seeks to use all possible instruments and techniques for quantitative determination of the various parts and functions of the patient, but it insists that those quantitative findings must be ordered to the very specific, idiomatic frame of reference found in the individual patient with his peculiar personal life situation. We may, on the one hand, construct norms of action, speech, belief, and expression for which we can cite the cultural and social sanctions of the whole of our society or of more limited portions thereof and assert that these norms constitute valid criteria by which we can assess, or, on the other hand, measure the adequacy of performance and conformity of individual members of the group, recognizing that there are successive steps or levels of performance and conformity as in the norms for chronological age groups. With this assumption and with this intent we may then place any single child in this more or less Procrustean bed, designating him as retarded or defective if he is unable to attain the norms for his age group or giving him an enhanced status and superior designation if he can precociously exhibit the normative standards of a higher age group. This, in a sense, may be said to characterize what has been done under the guidance and direction of psychometrics both by students of child psychology and by those who have applied these measurement devices for more practical purposes.

The clinical approach accepts these various standardized norms and other quantitatively derived standards, but insists upon obtaining a variety of observations and, whenever possible, measurements of widely varying structures and functional activities and behavior and upon utilizing each of those data relatively, *i.e.*, as modified by other measurements and assessments and life history for each individual. It will be noted that the clinical method insists upon interpreting even the most rigorous quantitative results as having a greater or less significance, according to the larger organic, individual configuration or field in which they appear. Needless to say, this introduces at once an element of personal and uncontrolled judgment that when highly developed and tested by prolonged experience enjoys the designation of "good clinical judgment." Moreover, those who possess this undefined and seemingly undefinable capacity for good clinical judgment cannot adequately describe how they arrive at their diagnosis or indicate to any satisfactory extent how they proceed in giving the weight they assign to different clinical findings. The skillful surgeon also has difficulty in giving a verbal formulation of the delicate neuromuscular coordinations and quick-thinking judgment he employs in an operation in which his unverbalized experience guides his activities.

All this of course creates many difficulties and exposes the clinician to criticism and sometimes scornful dismissal by those who insist upon the necessity for purely objective data and the use of impersonal methods that can be duplicated by any competent user. We have, therefore, a seeming impasse for students who use the methods that produce what they designate as quantitative and objective data and are, by the very nature of their methods and their reliance upon standardized norms, more or less limited to the construction of what might be called "artifacts" or purely ideal standards against which the individual child may be rigorously held for rating or assessment. It seems fair to say that these procedures do not tell us very much about the child himself because they are focused upon locating the child upon a particular rung of the ladder of development and maturation or learning, constructed as an ideal, but largely artificial, frame of reference for groups of children, not for individuals. With such a sieve children can be sorted for various groups and assigned to different categories that facilitate a variety of practical purposes, as in educational administration.

On the other hand, the clinical approach reveals often astonishing results in the sense of insightful understanding of the behavior and inexplicable emotional reactions of an individual. Moreover, the performance of the patient in the standardized tests is often revealed as having a significance that the objective-test results may fail to disclose. The interest of the clinical approach is in an understanding of the individual child, and just because of this concern the clinical responsibility of the physician and psychiatrist cannot be avoided; but the clinical approach has seemed destined to remain outside the limits of acceptable scientific procedure.

In the development of these clinical methods the psychiatrists set up a procedure that was called the "threefold approach," *viz.*, a psychometric examination of the child in order to obtain standardized test findings about the adequacy of performance; the psychiatric or clinical interview in which the child is invited to reveal, so far as he can or will, the source of his difficulties and the nature of his feelings; and the case history that brings together from available sources a biography of the child as related by the family and teachers and other adults who are familiar with him. The development of child guidance thereby brought into one phase of the study of children the clinical, psychometric, and biographical approaches. The psychologists who worked in these clinics were early called upon to recognize that, however precise and quantitative the findings from the use of standardized tests, they were susceptible to varying degrees of interpretive modification in the light of the case history and clinical examination and interviews. Thus, through the child guidance movement and in other situations where the psychometric examiners were brought into immediate and personal contact with children and were given biographical material such as that supplied by visiting teachers and cumulative school records of individual cases, the quantitatively determined results underwent a process of clinical interpretation and modification. In a sense, therefore, there began to develop a split between those who continued to construct, elaborate, and refine standardized tests through the manipulation of the data obtained from children they rarely, if ever, saw, and the clinical psychologists who examined specific individual children for diagnostic and remedial purposes, as in counseling and guidance.

Nature and Nurture

One persistent concern in the field of child psychology, especially in psychometrics, has been the endeavor to distinguish and, if possible, to measure the seemingly divergent and contrasting contributions of nature and nurture, or the impact of experience and care in the development of whatever capacities the individual child may exhibit. For this study, as in all scientific endeavors, it was necessary to make certain assumptions, and for this purpose it was assumed that one could construct norms of performance that were appropriate for each chronological age group, as statistically established by accepted standardized procedures. Further, it was also assumed that all children in the same chronological age had equal opportunity to learn or develop these norms of performance and that therefore any falling short in their performance could be attributed to the differences in hereditary endowment which limited their capacity to develop these standardized performances. These assumptions not only emphasized the contrast between nature and nurture but made the determination of hereditary endowment an unquestionable result of the application of standardized tests. Upon these assumptions and with these procedures, therefore, many elaborate and very ingenious studies were made that revealed these assumed genetic differences. Moreover, wide-ranging samples of the child population indicated that there were large differences in inherited mental capacity occurring in different social, economic, and racial groups.

It would be neither appropriate nor desirable to rehearse any of the extended discussions and often bitter controversies that have arisen in this field of nature versus nurture. Positions have been taken on both sides from which their proponents cannot or will scarcely retreat, and, while many of the younger students in child psychology will undoubtedly feel it necessary to align themselves on one side or the other of this now historic controversy, it would seem more appropriate here to show this problem in the perspective which will probably be seen in later years.

Two significant contributions to this problem have been made by the students of somatic development and by those engaged in child guidance. From the latter, as indicated earlier, has come the general belief that the results of standardized tests must be clinically interpreted, since a child whose performance on the standardized tests indicates a pronounced degree of retardation, if not mental defect, may have had a life history of severe and often prolonged emotional difficulties arising from acute anxieties and other affective reactions to cruel and coercive child rearing or parental rejection and neglect. These pathetic figures have lived in a condition of chronic misery, unhappiness, and often acute emotional disturbance which have made learning in the sense of developing the capacities for language, thought, and action expected of the so-called "normal" child largely, if not wholly, impossible. Such children have physically existed for the number of years designated by their chronological age but during that time they have been effectively prevented by their unhappy experience from developing the required skills and capacities just as if they had been shut up in a dark cell, subject to continuous psychological insult.

The assumption that a child of given chronological age has had the same opportunity as his contemporaries to develop his capacities therefore is becoming increasingly dubious. Moreover, the designation of these unhappy children as congenitally handicapped or defective and their assignment to the categories of the hopelessly retarded begins to appear as a cruelly unfair and socially intolerable practice for which no amount of quantitative and seemingly scientific sanction can be offered as justification.

From somatic studies other findings have been cumulatively challenging the assumption that children of the same chronological age constitute a homogenous group because they have had an equal period of organic existence. It now appears that children born at the same time differ widely in their maturation and development, as shown by different methods of examination, assessment, and measurement. The history of the early establishment of very rigid height and weight tables for each chronological age for boys and girls is illuminating on this point. These became fixed canons for parents and schools and even some pediatricians but were followed by the realization that children differed not only because of inherited constitutional patterns, but also as a result of the adequacy or inadequacy of nurture, especially nutrition. Today we may venture to assert, as T. Wingate Todd was so fond of saying, that the individual child, by the very biological process operating in his organism, "punches the time clock" of growth, but that his progress toward maturation and further development varies with the conditions of his nurture and care.

It seems clear that the sequence of growth through which children pass from conception to early adult life is an orderly path; there is a sequential process of change exhibited not only in changing dimensions, but in the order in which different portions, segments, or somatic features are activated into more rapid growth. The moment we make this statement of the orderly sequence of growth we must immediately add that each individual child, with his unique hereditary constitution, aided or handicapped by his nurture, will move along that well-defined sequence of growth at a rate that is more or less unique and will express his attainment of the different stations along that route in dimensions and other evidences of maturity that are likewise uniquely individual.

Thus we may assert that child growth and development do have order and regularity as a *process*, but that this process does not necessarily produce fixed standardized dimensions or bodily proportions or any other equal or identical dimensions. Indeed, the accumulating findings compel us to assert that individual differences are significantly found in the whole process of growth and development.

The developmental sequence—*i.e.*, the changing process whereby the individual organism is progressively transformed, with varying periods of acceleration and retardation, into the mature adult functioning organism—and indeed the more specific processes that we designate as maturation show a wide range of variation and a susceptibility to the influence of nurture that are of great significance for the future. Not only do the developmental anomalies and the widespread so-called "defects" found in children and adolescents appear as the symptoms of inadequate or deficient nurture, but many variations in functional capacity and performance are likewise being interpreted as the product of the individual's nurture. The evidence for this picture of differential rates of development and maturation is found in the data on physical growth and maturation from X rays showing how the process of skeletal maturation is taking place, in hormone assays, in direct examination of the genitals and indicators of puberty showing how sexual maturation is proceeding, and in numerous other significant indicators of the ongoing process of development and maturation. The assumption that children of the same chronological age constitute a homogeneous group can therefore scarcely be maintained.

From both clinical and experimental studies of physical development have come indications that some developmental anomalies and retardations are symptoms of severe nutritional deficiencies or disturbances; it has been found not only that a complete lack or deficiency of certain vitamins and minerals can handicap a developing organism, as in rickets, but, what is more serious and difficult to meet, that certain organisms even when provided with a fully adequate diet are, unfortunately, unable to utilize vitamins and minerals thus provided; they cannot adequately digest and assimilate or they cannot effectively utilize, in the later stages of metabolism, what they eat. Only within the past few years has it been realized how profoundly disturbing and effectively handicapping some of these deficiencies may be. Listless, apathetic, inattentive children who, by many tests and through the most casual examinations, appear to lack mental capacity have been found to be suffering from prolonged anemias, as in certain areas in Florida.* Others have been disclosed as suffering from deficiencies of the vitamin B complex (so-called "morale" vitamin), and of nicotinic acid (pellagra preventing), and so on through the list of vitamin and mineral requirements. These discoveries about the fundamental importance of nutrition have far-reaching significance for all phases of child psychology, and they suggest that the performance of children on standardized tests and in the less systematic requirements of academic work may be compromised by sheer nutritional deficiencies. Moreover, this applies to the work of pediatricians, anthropometrists, and others who have been measuring and otherwise studying children in the hope of establishing norms of physical development; their measurements of run-of-the-mill children reflect all the sins of omission and commission in their nurture and must be critically examined lest we set up as desirable norms for achievement what are but the accidental outcomes of our unsystematic and unenlightened nurture of children—"norms of mediocrity," as T. Wingate Todd characterized them.

It may be appropriate here to suggest that, with the growing understanding of how the vitamin B complex and to some extent vitamin A are so critical in the functional activity of the central nervous system, it is not unlikely that future studies will show some highly disconcerting, not to say startling, results. If, as psychometric surveys have shown, the frequency of low-grade and retarded mental capacity is greatest among the children of the lower socioeconomic classes, in which occur the most pronounced nutritional deficiencies, then it seems at least possible that the mediocre, poor intelligence of many children may be a product of inadequate nurture, especially during the prenatal period, when a deficiency of vitamin B complex at the critical period when the central nervous system is emerging in the fetus may tragically block the growth and functional capacity of those structures which are so sensitive to these deficiencies. The nature-nurture studies have tended to ignore the process of prenatal nurture or gestation, during which the growing fetus is subject to many and often handicapping deficiencies and disturbances; the fetus may and usually does *grow* according to schedule but his development and differentiation are often compromised by inadequate and insufficient nutrition or disturbances of pregnancy and labor.

In the light of the foregoing it can be asserted that child psychology, the specialized discipline devoted to the study of child behavior and the various activities that we call by different names, can proceed *only at its peril* to study children in ignorance of these various processes of growth, development, maturation, and the various deficiencies of nurture. Child psychology, if we may hazard a bold generalization, can justify itself as a separate discipline, promising valid scientific knowledge of children, only insofar as it is prepared to utilize its methods and procedures, its concepts, and its theoretical formulations, as one instrument along with all the other instruments that must be orchestrated upon the larger theme of child development. The other disciplines concerned with aspects of child growth and development are likewise faced with the same need to collaborate with others in the attempt to understand child growth and development, especially the child's behavior and personality expression.†

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* Reported by Florida Agricultural Experiment Station, University of Florida, at the Eighteenth Annual Conference of the Milbank Memorial Fund, Apr. 2 and 3, 1940.

† The organization of the multidiscipline scientific association, The Society for Research in Child Development, signalized the recognition of this principle.

Child Development

Psychology and child psychologists have not been unaware of these changes, as shown by their growing interest in child development, which marks a larger and more comprehensive concern for the study of child growth, development, and maturation, including behavior and other psychological expressions of children. Increasingly, students of child psychology are being given at least an elementary knowledge of child development so that they will be aware of these developmental processes in the growing child. Thus it is being recognized that the child as a living organism will yield as many different data as we have the capacity to record and, if possible, measure and that all these data are related as different dimensions of the organic field of the child. The problem of child development therefore shifts the interest from the relation between two variables measured in a large sample of children at one moment to the study of the developmental processes as revealed through many different observations and measurements on one child over a period of years. The recognition of the hitherto neglected importance of time exhibited in child development studies likewise reflects a growing concern with time and the problem of sequence that is characteristic of more recent scientific endeavors (3, 5, 7).*

The organization of longitudinal studies of children may be cited as indicating an interest in observing how the changing structures, functions, and activities of the individual organism are transformed through periods of time (*cf.* 8). Up until recently it has been assumed that one could study the problem of growth of an organism or any of its constituent parts or functions by examining large groups of children of different age periods and aggregating the observations and measurements of this large array of subjects. Relatively smooth graphs have been constructed from such multiple collections of cross-sectional data and they have been regarded as offering an essentially valid delineation of the growth process. Within recent years, however, the assumptions underlying these studies have been increasingly called into question, as at the American Association for the Advancement of Science meetings in New Orleans, December, 1931, Section H, Anthropology, which held a symposium on development in which the discussion was summarized as follows:

> In the realm of physical anthropology emphasis centered very largely around the question of growth. Papers and discussions . . . were focussed to an unprecedented degree on the individual, as contrasted with the group. Indeed, the sessions devoted to this subject left a rather definite impression that we may be at the beginning of a new era, in which *individual, rather than mass studies, will be foremost.* The importance of observing the same individual over the largest possible period was emphasized by nearly every speaker who dealt with any aspect of development.

In the intervening period various studies have shown that when, in place of these large statistical aggregates, attention is focused upon the growth sequence of single individual organisms over a period of years a somewhat altered picture emerges. Some established quantitative findings have begun to yield to modification and amendment, as shown especially in the

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* "Time has no constant value in growth and development; there are 'spring up' and 'fill out' periods; there are spurts of rapid growth, phases of slow progress. But the major theme is one of integration so that spring up and fill out, spurt and slow phase alternate rhythmically to produce balance and at least an attempt towards attainment of an optimum. It is to be remembered that perfection may be the standard but adequacy is the goal" (13, p. 281).

Harvard Growth Study, which showed not only how the longitudinal picture differed from the cross-sectional, but also that chronological age categories produced large distortions and errors in the picture of growth and maturation (4, 16).

It is well recognized that the longitudinal study involves many difficulties, both scientific and administrative, arising from the shifting about of families and the consequent loss of subjects during the prolonged period of such a study; moreover, the very rapid development of new methods and procedures tends to render obsolescent the original repertory of methods selected at the beginning of the study. These difficulties, however, are more than compensated for by the character of the data that are obtained through longitudinal studies of the same children. The desirability of such studies in child development is being strengthened by what has been taking place in other biological studies. Today it is no longer permissible, at least in experimental work, to utilize run-of-the-mill animals of unknown heredity, age, and nutrition. Laboratories now insist upon pure-strain stocks and the utilization of subjects of known age and fully recorded nutrition, so that they may avoid the uncertainties and the often extreme disturbances that would otherwise creep into their experimental findings. This may represent an ideal far beyond the possibilities of child development studies, but it at least indicates that the concern for subjects of known history and nurture can be met at least partially by longitudinal investigations that follow the same children, with the precise observations and records accompanied by careful biographical records that show what has been happening to the child in all the other aspects of living.*

The interest in individuals, which has appeared to many as lying outside scientific study with its concern for larger generalizations and uniformities, has more recently begun to emerge from the seemingly uncontrollable province of clinical "hunches." The realization, in physics, that beneath the uniformity and regularity of aggregate events there is much discontinuity, disorder, and unpredictability of individual molecules, atoms, and electrons, has begun to alter the older search for regularity and uniformity and favor the study of individuality. Experimental methods are being developed to reveal the peculiar, idiomatic growth and functioning of the individual and increasingly attention is being given to the pattern or configuration of responses given by individual subjects to standardized test procedures and experimental setups. Instead of statistically derived norms for a group, the individual's own growth curve may be used as a norm (13, p. 284).

If space were available it would be desirable in this historical sketch of child psychology to rehearse the steps in the development of the study of personality which in earlier years was approached (and still is being approached by some) as a problem essentially the same as in psychometrics, to construct an instrument that would reliably and validly measure the various traits or other specific components and expressions of the personality. Much time and effort have been spent in constructing standardized inventories or rating instruments to evoke the individual's opinions, beliefs, and feelings toward specific topics and questions. These tests and inventories have provided means for classifying and segregating individuals into certain broad categories of reactive types or affective disorders, but they have not been very fruitful in revealing the make-up and idiomatic functioning of the individual personality (12).

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* Reports of such longitudinal studies on older children will be forthcoming within the next few years from the University of California (*cf.* Chap. XVIII) and Western Reserve University.

More recently there have appeared a variety of procedures that have been called "projective methods" for eliciting from the individual the way he organizes and interprets experience and feels toward situations and people (*cf.* Chaps. XX, XXIII, XXIV, XXXII). These projective methods are constructed on the assumption that, when the individual is presented with plastic, unstructured materials, he must organize and interpret them and thereby reveal his characteristic personality as a dynamic process, not an aggregation of discrete traits or atomistic motives. These procedures offer a means whereby clinical hunches and the concern for the life experience of subjects may be translated into methods that can be made increasingly reliable and valid. Instead, however, of seeking to establish reliability and validity by the well-established statistical procedures, those who are developing these projective methods are relying upon the internal consistency of findings derived by various methods applied to the same subject, plus intensive clinical and historical findings, to establish their reliability as instruments and are looking to "temporal validation," *i.e.*, to the confirmation of the validity of the instrument by later findings on the same subject. These methods are increasingly demonstrating the "selective awareness" of each individual, who can only see, hear, and otherwise perceive what he is sensitized to perceive. These recently developed methods, of which the Rorschach Ink Blot procedure may be cited as the oldest and most adequately tested, cast doubt upon the assumed objectivity of experimental psychology. The assumption that a stimulus situation, however carefully controlled, will mean to the subjects what the experimenter believes and intends, is hard to maintain in the face of the demonstrated differences in what each subject finds in the stimulus situation. Indeed, it becomes difficult to state what an "objective" stimulus situation is when we realize how each subject or species reacts to a different configuration and meaning in a situation which can be stereotyped to a certain extent by cultural training but which remains idiomatically diverse to each subject. The rigorous training in scientific methods of observation and measurement testifies to this essentially individual distortion of perception and cognition. In the child and adolescent, before culturally standardized patterns have been fully learned, the idiosyncrasies of perception may be very large. Moreover, it should be recognized that there is considerable *variability* of functional activities and behavior response from time to time in each individual which enters into and may disturb the most carefully obtained measurements. *Variability* within the individual, as distinguished from *variation* among individuals, will undoubtedly receive increased recognition because it bears so directly upon the reliability of measurements, especially on unstable children and adolescents.

Since child psychology in its earlier years more or less neglected the study of personality development for the more readily observed habit studies of age groups and specific trait-age correlations, the growing interest in the study of personality through projective techniques is to be noted as an exceedingly interesting and promising development. As pointed out elsewhere, these techniques are similar to the more recently developed methods in physics, chemistry, and biology, from which psychologists may derive reassurance despite the novel and unprecedented character of these projective methods.*

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* *Cf.* 10, which contains bibliography of recent studies.

Culture and Personality

The problem of human behavior, or more precisely of human conduct, since human behavior is transformed by the operation of cultural traditions and child rearing into patterned conduct, begins to appear as the major problem of our times. It is obvious from the accumulated material on other societies and cultures that human nature is highly plastic and can be and is patterned into an amazing variety of group-sanctioned ways of living and feeling that give each cultural group its characteristic design.* Since what we call culture and society are not cosmic organizations or superhuman systems but are the historically developed patterns of action, speech, belief, and feelings, the continuity of culture depends upon the inculcating of tradition in children. Moreover, the kind and degree of social order arises from the personality-character structure of the individuals making up that social group. It is evident, then, that the possibility of improving human life and achieving some more humanly desirable and valuable social order rests upon our ability to modify personality development in the growing child and to reconstruct our traditional culture toward more desirable patterns. The democratic aspiration toward the conservation of the individual waits upon the development of methods for recognizing and fostering individuals as personalities capable of participating in a democratic society (*cf.* 11).

In any such endeavor child psychology must play a major role, seeking ways of understanding personality development, the socialization of the child, and the operation of group living. For such labors child psychology will need an understanding of culture, of how culture is transmitted to the growing child, and of how the child, under the impact of this cultural training and the intimate contacts with cultural agents, the parents and teachers, develops his personality with his idiomatic way of perceiving, acting, and feeling. Enough has already been done to point the way forward for those who are courageous and ready to pursue these paths that depart from the established methods and problems. The projective methods and the experimental procedures recently developed by the Gestalt-topological group for manipulating social situations and reconstructing the individual's "life space" offer the same opportunity for vigorous, creative exploration as did the earlier methods of a generation ago.

Recent attempts by Kurt Lewin and his coworkers (14, 2) to establish by experimental procedures the validity of concepts designed to order events and also to give an understanding of individuals are of large significance since they mark a change in long-accepted attitudes; heretofore, variations and deviations from central tendencies and from relationships showing a high coefficient of correlation were regarded as serious but inexplicable shortcomings on the part of nature which must be recognized but only as deplorable breakdowns in a well-ordered world, of little importance to science. This cavalier dismissal of aberrent individuals and of occurrences on the extremes of distribution curves is no longer necessary or desirable, especially in child psychology.

To the young student who looks at child psychology and perhaps contemplates a professional career, it might be urged that the major and enduring contribution which any scientist can make is primarily to prepare the way for his successors. The outstanding students of the past and of the present have opened doors, have courageously pushed forward their inquiries, and have created a body of knowledge, a set of concepts and theories upon which those who come after must build. It is in no sense a denial of the enduring value of their work or an expression of criticism to assert that the creative work of the future must go on from where they left off. Indeed it may be said that we cannot better recognize or acknowledge the work of our predecessors than by attempting to do for our day what they did for theirs.

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* *Cf.* recent studies of child rearing in other cultures, notably Mead (15) and Erikson (6), and the writer's description of our own cultural patterning (9); also Chaps. XXXIV and XXXV of this volume.

As we have attempted to point out earlier in this discussion, students of child psychology proceeded on the basis of perfectly valid assumptions for their day and developed instruments and procedures that were highly ingenious and entirely adequate as judged by the knowledge and understanding available to them. When, however, we look at the cumulative development of the study of children over the past two or three decades and observe how the very distinct and almost alien disciplines of the life sciences have increasingly come to focus upon the study of growth and development, and more specifically have attempted to concentrate their studies upon the same children so that their data might be utilized in the attempt to arrive at a more comprehensive and multidimensional understanding of these processes, it seems more than appropriate to exhort the young students coming to this source book to read, to note, and to digest these accounts of what has been done, with the firm and modest conviction that they can and must attempt to advance knowledge in this area by recognizing some of the newer scientific conceptions and more recent findings and the newly emerging problems of child development upon the study of which all the life sciences can collaborate.

This is not the occasion for any elaborate rehearsal of what has been occurring in the way of conceptual reorganization in scientific thinking and investigation. It may be useful, however, to point out that the concept of relativity necessitates that every observation must be ordered to the field in which it occurs; therefore it is no longer necessary to seek unchanging absolute dimensions or unvarying relationships. Thus it is becoming increasingly necessary to conceive of the world, not in terms of cause and effect, of stimulus and response, of large-scale forces acting at a distance, but rather to view events as various forms or expressions of energy transformations occurring in a field and propagated through diverse mediums. Data, therefore, are only data and should not be reified into entities that give rise to artificial and misleading problems. The world, every situation, event, or organism is multidimensional and therefore calls for a multidiscipline approach for its adequate study.

It is also being shown that simple quantitative methods are limited in their capacity to deal with the problems of this space-time world. The older procedures that were content with revealing how much of each substance was present, as in quantitative chemistry, are now being superseded by methods and concepts designed, as in stereochemistry, to show not merely how much carbon, oxygen, hydrogen, etc., are present but how each atom of these substances is spatially located and related in the molecular configuration. Thus a shift from one position of attachment or valence to another position, especially in organic compounds, may be the distinguishing characteristic of two quantitatively similar but radically different compounds, as seen in steroid chemistry.

It seems more than justified to assert that scientific investigations are increasingly concerned today with pattern and configuration and fields, reflecting the movement away from the older atomistic conceptions and methods. Instead of the older Aristotelian conception of parts upon which some mysterious organization is imposed, organization is being viewed as the persistent space-time pattern of interaction of the "parts" within the field of their occurrence, wherein they must be ordered and interpreted relatively. Thus identical magnitudes measured in a series of organisms may not be similar, while different dimensions may be equivalent when viewed relatively within the biological fields of each organism. Furthermore, similar configural patterns may be overlooked when we focus upon discrete dimensions of an organism: two triangles, one with sides 1 cm. long and another with sides 1 km. long, have equivalent triangular patterns not apparent when we measure and compare measurements of only one side.

The basic assumption that nature is orderly once rested upon the belief in the possibility of demonstrating quantitatively a uniformity and regularity, if not identity, in events. Today it is being stated that the order and regularity of nature are to be seen in the persistent orderly processes and sequences which may give rise to or exhibit quantitatively different structures and events. Recent studies, especially those with "tagged atoms" and isotopes, have shown that the constituents of the organism are continually being replaced, as are most of the cells; yet the organism persists, because the organic process maintains that structure, function, and behavior despite changing constituents and cells and increasing or decreasing dimensions. Thus the preoccupation with the product or expression may obscure the process, as is seen in many investigations of child growth and development that have focused on specific measurements at one moment in time.

In the history of ideas of the nineteenth- and twentieth-century science, it seems probable that considerable emphasis will be given to the rise of a broad and comprehensive scientific enterprise that may be called "human biology," in which the three major disciplines, embryology, genetics, and paleontology, began to reveal what takes place in gestation, in the subtle, complicated operation of heredity, and in the continued expression of man's mammalian ancestry; and in which the medical, the biological, and social sciences, including research in child development, systematically recorded and disclosed the complicated interplay of events expressed in the life span of man, from birth through childhood and adolescence on into the years of full adult functioning and then continuing into the years of senescence. Our successors will look back with admiration upon the beginning of this scientific enterprise through which man may, with increasing surety and understanding, conserve and develop the full resources of the human species.

Insofar as child psychology shares the desire and cherishes the hope that its labors can contribute to social progress, it seems clear that, if it continues along the lines of its predecessors and limits its interest to the now classical problems, it must become increasingly remote from the actualities and needs of our society.

If each young student, however minute and limited his immediate problem, can proceed with a constant awareness of this larger responsibility that human biology must bear, then his endeavors will contribute to this future and give his work the significance that every scientific achievement enjoys when it is carried on in the context of a larger conceptual scheme.

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CHAPTER II

REFLEX ACTIVITIES IN THE HUMAN FETUS*

DAVENPORT HOOKER

Introduction

Behavior may be considered an expression of the functional capacity of an organism which, in turn, is the resultant of the functional capacities of the various structures, the tissues and organs, which constitute it. In the development of an organism, anatomical growth is accompanied by physiological growth. Development is, thus, a functional, as well as a structural, process. The structural development of an organism has long been known to be an orderly, sequential process. However, only relatively recently has general acceptance been accorded the view that fetal activity, whether human or infrahuman, is also an orderly, sequential process, preliminary to the postnatal development of adult behavior.

Preyer (9), working on a variety of vertebrate forms, was probably the first to give a clue to this now generally accepted thesis. During the past 30 years, numerous studies on vertebrate embryos and fetuses have afforded ample proof of it. The most brilliant of these studies is the fundamental work of Coghill (3) on Amblystoma. Nevertheless, much remains to be done to determine the details of the sequence of fetal activities in the mammals, particularly in man.

In the literature during the past century, isolated accounts of the movements of casually observed human fetuses are to be found. The first systematic study of fetal reflexes in man was begun about 1920 by Minkowski (8), whose publications contain the classic description of human fetal activity. The work of Bolaffio and Artom (1) unfortunately added relatively little to our knowledge, as their observations appear to have been largely made on fetuses which were probably incapable of exhibiting normal responses.

The studies to be discussed here (5, 6, 7) were begun in 1932 to determine whether modern methods of motion-picture recording, of stimulation, and of handling the material to be observed, together with an interpretation from a physiological-embryological viewpoint of the results obtained, might clarify many of the points at issue and extend the factual basis of human fetal activity. This is greatly needed to provide a substratum for an understanding of postnatal behavioral development, to correlate function with the structural growth of organ systems and to serve for the better interpretation of a number of psychological and psychiatric problems. Though still incomplete, these studies have demonstrated that much can be done toward fulfilling their primary aims.

Inasmuch as the nature of the problem imposes upon the observer condi-

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* The investigation on which this account primarily rests has been aided by grants from the Penrose Fund of the American Philosophical Society, from the Carnegie Corporation of New York, and from the University of Pittsburgh. The sequence of appearance of reflex activities in the human fetus during the first six months. Publ. 10 Physiological and morphological studies of human prenatal development.

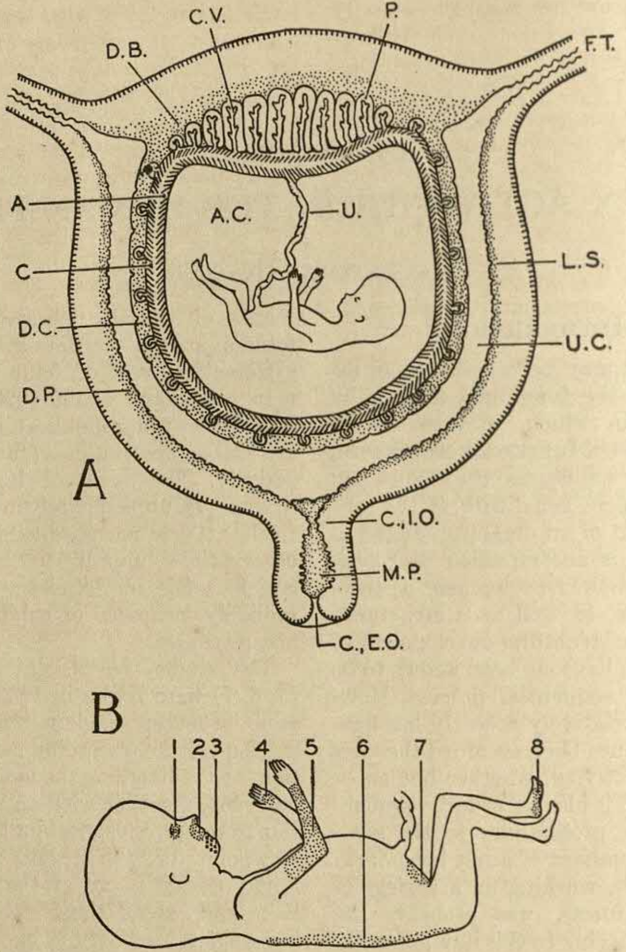

FIG. 1*A*. A diagram of the human fetus in the uterus, at about the 12th week. The fetus lies in the amniotic fluid in the amniotic cavity (*A.C.*), attached by the umbilical cord (*U.*) to the placenta (*P.*), which is the site of interchange of oxygen, carbon dioxide, food, and waste materials between mother and child. This interchange takes place between the maternal blood plasma surrounding the fetal chorionic villi (*C.V.*) and the fetal blood in capillaries within the villi. The fetal membranes consist of the amnion (*A.*) and the chorion (*C.*). These lie outside the uterine cavity (*U.C.*) within the lining membrane of the uterus (the endometrium). That portion of the endometrium near the placenta is known as the decidua basalis (*D.B.*), the portion overlying the chorion as the decidua capsularis (*D.C.*). Later in intrauterine life, all trace of the uterine cavity (*U.C.*), from the Fallopian tubes (*F.T.*) to the internal os of the cervix (*C.,I.O.*), is obliterated by fusion of the decidua capsularis (*D.C.*) with the decidua parietalis (*D.P.*) or vera. At birth, the amnion, chorion, and decidua capsularis ("bag of waters") rupture at the internal os and the child passes through the cervical canal (from the internal to the external os, C.,E.O.) into the vagina. During pregnancy, the cervical canal is often blocked by a plug of mucous (*M.P.*). After birth of the child, the deciduae separate (along the line, *L.S.*), leaving only a thin layer of endometrium from which the uterine lining is regenerated, and with the fetal membranes leave the uterus as the "afterbirth."

B. Diagram of a human fetus of about 14 weeks, showing some of the areas of stimulation, to which specific reference is made in the text. (*J. R. Dickenson, del.*)

tions which are not completely under his control, an evaluation of the sequence of reactions to be described may be assisted by a brief summary of the normal environment of the human fetus and a survey of the circumstances relating to its reflex activity when under observation. The human organism is usually called an "embryo" during the first 10 weeks of its development, when the primordia of most, if not all, of its organs are being formed. Thereafter, it is termed a "fetus." (In this account, the term "fetus" will be used to the exclusion of the term "embryo.") The human fetus develops inside the amnion, surrounded by amniotic fluid and connected through the placenta indirectly with the maternal blood stream (Fig. 1*A*). When small, it is relatively freely suspended in the amniotic fluid, which forms for it a protective buffer maintained at a fairly constant temperature. As it grows larger, it fills a greater proportion of the amniotic sac, and the uterus and membranes exert more hampering and confining pressure upon it. Through the thin separation between the maternal sinuses and the fetal blood vessels in the placenta, the chemical requirements of the fetus are supplied and its waste products removed.

Studies on mammalian fetal activity present certain difficulties, especially in the proper evaluation of their results, because the conditions necessary for the observations produce many changes in the requirements for normal fetal existence. As a result, all accounts of directly observed fetal activity in man and other mammals should be viewed with some suspicion as to the absolute normality of the movements described, until more is known of the effects of these changes. This is particularly the case in considering accounts of human fetal activity. To what extent these conditions may influence and modify the observed activities is not now clear. In spite of this, it is important to learn what the human fetus does and how its behavior develops under present optimum conditions for observation.

The majority of human fetuses available for the observation of activity younger than twenty-three weeks of age, as calculated from the beginning of the preceding menstrual period (menstrual age*), have been operatively removed from the uterus for definite therapeutic reasons. Those older than that are, in general, prematurely born. When operative interference or premature birth occur, all of the normal intrauterine conditions are altered. A certain amount of physical insult is suffered by the fetus, the pressures to which it has been subjected are suddenly released, the temperature control of its environment breaks down, and the placental connections are severed. Before all these changes occur, it is rarely possible to observe an operatively delivered fetus for more than a few seconds.

Because the placental connections are the sole effective source of oxygenation of the fetal blood stream before twenty to twenty-five weeks of menstrual age, asphyxia begins immediately after their separation. It is still a matter of discussion how soon asphyxia affects the fetus's activity. Certainly it acts within minutes. Windle and his coworkers (4, 11) claim that it is almost instantaneous in affecting normal movements. The results secured in this study do not seem to bear this out. In the light of recent chemical work on early fetuses, it appears highly probable that the importance of failing oxygen supply, per se, has been overestimated. It is certainly not an uncomplicated factor, and other factors may play equally important roles in modifying or inhibiting fetal movement.

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* As menstrual age is usually some 10 to 15 days longer than actual age, which cannot be determined, an allowance of this order of magnitude must be made to approximate true age.

Most drugs administered to the mother, as a sedative before operation or as an anesthetic during it, also affect the fetus. Such drugs produce effects differing both with the nature of the drug used and with the individual's tolerance of it. Only fetuses secured from operations performed under local or spinal anesthesia with novocain or its associated derivatives, without preliminary use of a sedative, may be regarded as probably unanesthetized. However, fetuses from operations where ether, nitrous-oxide, morphine, and, under certain conditions, other anesthetics have been employed may exhibit activity seemingly normal in character. Here, again, individual tolerance appears to play a most important role.

To illustrate what can be done to alleviate these adverse conditions, the following brief summary is given of the method of handling, for observation, a small fetus incapable of continued existence. During the operation, every effort is made to keep manipulation to a minimum and to deliver the fetus with membranes unruptured. As soon as delivered, the fetus is quickly removed to the observation room, immersed in saline or Tyrode's solution warmed to about 90°F., the membranes opened, the fetus floated onto the gloved hand, and fetus and placenta placed in warmed solution in separate, but adjacent, containers under the motion-picture camera. Oxygen under pressure is supplied to the covered dish containing the placenta, small notches permitting exit of the umbilical cord and entrance of the oxygen tube. The fetus itself is supported on a silk or cotton "hammock" which, being dark in color, affords a background for the photographs. Needless to say, during the period between the beginning of separation of the placenta and the beginning of the cinematographic record, the fetus is watched through the membranes for spontaneous movements.

Such a method of handling reduces to a minimum chilling or drying of the fetus, affords adequate support for it, and at least provides sufficient oxygen through the fetal part of the placenta to continue good heart action, though it does not appear to increase the period during which the fetus will move. Neither this nor any other method of handling yet devised can provide completely adequate oxygenation of the blood stream, a service of supply and waste removal, maintenance of intrauterine pressures, and avoidance of some manipulation. Only when the fetus is of sufficient age to permit the establishment of respiration by a resuscitator can adequate tissue oxygenation be brought about and asphyxia overcome.

It is probable that the fetal activity seen is quite normal, in spite of the imposing list of difficulties encountered. Certainly true reflexes have been elicited and it has been possible to establish a definite sequence of characteristic activities associated with different age groups. Indeed, the activities at a given stage of development have proved to be so uniform that the age of a fetus under observation can be predicted accurately from its performance before its length or history is known. Furthermore, this sequence of charactheristic activities constitutes a true development of behavior accompanying structural development. Additional evidence regarding the normal character of this sequence is afforded by the chemical studies of Youngstrom (12).

An important consideration in observations of fetal activity is the nature of the stimulation employed. The younger the fetus the thinner and more delicate is the integument (skin). As it is desired to use tactile (touch) stimulation, great care must be exercised in selecting esthesiometers (stimulators) which will not injure the integument of the youngest individuals nor directly stimulate their muscles by pressure through the skin, but which may yet serve as an adequate stimulus on the increasingly thicker integument of older fetuses with the accompanying rise in threshold. Manifestly the only solution of the requirements is to be found in a series of esthesiometers graded for the various required thresholds. Accurate grading is difficult to accomplish, but an entirely practical series of esthesiometers of hair may be calibrated by the approximate pressure which they exert when maximally bent. In the studies here to be discussed the series used began with an esthesiometer of human hair of such length as to maintain a balance with 10 mg. The remainder of the series, using horsehair of appropriate caliber and length, balanced 25, 50, and 100 mg., 2, 5, and 10 g., respectively. The cut ends of the horsehairs were covered with a smooth bead of Duco Cement to prevent abrasion of the skin. The lowest "weights" of hairs were used on the youngest fetuses, the highest only on premature and term infants. Naturally, such calibration is only a rough approximation, leaving out of consideration the pressure exerted by the area in contact with the fetal integument. However, as the hairs are very rarely used with sufficient pressure to bend them fully and as a stroke rather than a spot type of stimulation is alone effective, this method of calibration is sufficient to establish the maximum pressure that can possibly be applied with each esthesiometer.

Obviously, the use of steel or fiber needles, cactus thorns, and similar stiff instruments is not to be considered. Though their "gentle" application may serve adequately, there can be no control of the pressure exerted by them.

Many fetal reflexes are short in duration, quick in execution, and complex in character. Because of this, it is difficult to analyze them into their component parts and to record them at the time of observation. Motion pictures of the activities may be studied at leisure for analysis of the movements exhibited and form a permanent objective record which may be used as evidence for the conclusions drawn. In consequence, they are of great value in any study involving motion.

Reflex Activities of the Human Fetus

The description of human fetal activity which follows is based on a study of 65 individuals* covering an age range from seven to twenty-five weeks of menstrual age as determined from the individual histories and by checking against the Streeter (10) data. The accompanying table gives the age distribution and crown-rump length (sitting height) of each of the 65 fetuses observed. The fetuses have also been classified into three groups based on the probable absence, the possible presence, or the known existence of anesthesia as a complicating factor in their responses. The unanesthetized group consists of those fetuses delivered without general anesthetics or without the use of any drug which might have passed through the placenta to the fetus. The possibly slightly anesthetized group contains those cases in which the mother had received a drug which might have passed through the placenta, but in which the fetuses moved actively (if old enough to do so) and in many instances could not be distinguished on the basis of their responses from those in the unanesthetized group. Those fetuses listed as definitely anesthetized gave evidence of being narcotized, though some exhibited movement.

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* The entire study, which is still in progress, covers to date 18 additional premature to postmature infants. As this part of the observations is not complete, it will be omitted in this account.

TABLE 1.—THE DISTRIBUTION BY AGE OF THE 65 FETUSES FORMING THE BASIS OF THIS ACCOUNT

Age, weeks	Total number	Number unanesthetized	Possibly slightly anesthetized	Definitely anesthetized	Protocol numbers of fetuses in order of crown-rump length, given in parentheses in mm.
7	1	0	0	1	#1†(16)
7½	2	0	2	0	#11B*(19.5), 11A*(20)
8	1	1	0	0	#12(22)
8½	6	3	1	2	#4*(25), 22†(26), 24(26), 19†(26.5) 61(27.7), 29(28)
9½	4	2	1	1	#33†(32), 23(33), 16(35), 18*(36)
10	1	0	1	0	#34*(37?)
10½	1	1	0	0	#46(46.5, injured)
11	3	2	1	0	#26(48.5), 65(48.7), 51*(49)
11½	4	2	1	1	#44(53), 8†(54.5), 17(56), 9*(57, injured)
12	3	0	2	1	#5†(60), 39*(61.5), 38*(63.5)
12½	1	0	1	0	#6*(66)
13	2	1	1	0	#45(75), 14*(76.5)
13½	2	2	0	0	#31(80), 54(83.7)
14	6	4	2	0	#37(85.5), 2*(86), 40(87), 10*(88), 25(88), 13(88.5)
14½	4	3	0	1	#68(89.5), 21†(92), 62(92.7), 52(95.5)
15	1	1	0	0	#32(102)
15½	3	1	1	1	#30(107), 53†(110.7), 47*(112)
16	2	2	0	0	#27(114), 50(119.5)
16½	1	0	1	0	#43*(121)
17	1	0	1	0	#7*(123.5)
17½	2	2	0	0	#35(133), 70(134.5)
18½	3	1	1	1	#3*(145), 48(146.5), 28†(147)
19½	1	0	0	1	#20†(163)
20	1	1	0	0	#55(165.6)
20½	1	0	1	0	#82*(168.2)
22	1	0	1	0	#15*(190)
23	1	0	1	0	#41*(197)
23½	1	1	0	0	#56(204.6)
24½	1	1	0	0	#76(214.9)
25	4	4	0	0	#42(218), 59(219.2), 36(220), 49(220)
	65	35	20	10	Totals

* Possibly slightly anesthetized.
† Definitely anesthetized.

Eight and a Half Weeks.—The evidence so far available indicates that the human fetus becomes capable of responding to tactile stimulation at about eight and one-half weeks of menstrual age. Unfortunately, the number of cases observed in the series earlier than this is small and all but one (No. 12, eight weeks) were subject to the limitation of at least possible anesthetization of the fetus. That the one exception, of 22 mm. crown-rump length, did not move may not be significant.

The earliest type of reflex movement observed in human fetuses is in response to stimulation in the facial region supplied by the maxillary division of the fifth cranial nerve (the upper lip and adjacent nose and cheek region, Fig. 1*B*, 2), though within a very short time the region of the lower lip and chin (supplied by the mandibular division of the same nerve, Fig. 1*B*, 3) becomes capable of receiving stimuli. The characteristic reflex, which has been elicited by 10 mg. and "heavier" hairs, consists of a lateral flexion of the neck and trunk, usually toward the side opposite to that stimulated (contralateral), though sometimes toward the same side (ipsilateral), accompanied by some backward movement (extension) of both arms at the shoulder, causing the hands (the elbows are normally held somewhat flexed and do not participate in the movement) to describe a slight arc caudally, and by a slight rotation of the pelvic region with very slight abduction of the thighs. In returning to normal posture, the arms preceded the neck, trunk, and rump, which moved as a unit. In general, the younger the fetus, the less was the amount of rump rotation. In general, the converse also was true.

It should be emphasized that this typical response may be secured in the exposed fetus only by stimulation in the mouth-nose area of the face and that it is a stereotyped (repeated with little or no variation on each stimulation) but fully integrated movement. One fetus of this group was examined within the intact amnion before being freed from that membrane. Pressure exerted upon the amnion, when followed by a response,* caused the same reaction as that observed following stimulation of the maxillary-mandibular area in the fetus outside the amnion.

Stimulation of these fetuses in other regions than this failed to produce any response unless stiffer hairs (50 mg. or higher) were used. Where reactions were secured to stiffer hairs from other portions of the body, they were localized in nature, indicating direct mechanical stimulation of the muscles underlying the delicate integument.

Nine and a Half Weeks.—At this age, the typical response to tactile stimulation was of the same character as that observed at eight and one-half weeks, except that the lateral flexion of neck and trunk and particularly the rotation of the rump were more marked and that the arms might be somewhat abducted, as well as extended, at the shoulder. Again this typical response was stereotyped and could be evoked in the exposed fetus only by stimulation in the maxillary-mandibular area of the face. One fetus of this age also was examined *in amnio* before being exposed and, as at eight and one-half weeks, pressure on the amnion was found to cause movements identical in nature with those evoked in the exposed fetus by stimulation of the reflexogenous area (that area of the skin sensitive to stimulation).

Here, too, localized movements of the fetus could be secured in response to stronger stimulation of the trunk or limbs. Muscle-tendon (proprioceptive) responses were secured in one fetus (No. 16) by quick stretching of the flexor muscles of the fingers and again by stretching the biceps. At eight and one-half weeks, no movements of any fetus were observed which could not be traced to jarring, pressure, or intentional stimulation, but so-called "spontaneous" movements were observed at nine and one-half weeks. This merely means that the particular stimulus was not observed, not that endogenous sources of stimulation, whatever they may be, were effective.

Ten to Eleven Weeks.—These fetuses exhibited a gradual change in the nature of the responses. On stimulation in the ventral face area, they began to show a trunk and neck extension superimposed upon or replacing the lateral, chiefly contralateral, flexion characteristic of the earlier ages. Sometimes the response was a contralateral flexion which rolled into an extension of neck and trunk. In addition, though participation of the upper extremities (extension at the shoulder) and rump rotation might be present with the neck and trunk extension movement, they were not constantly so. On the other hand, thigh abduction appeared always to accompany trunk movement.

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* Light intermittent pressure or gentle tapping on the amnion may cause the entire fetus or one or more of its extremities to sway gently in the liquor amnii without causing the typical response.

In addition to the alteration of the neck and trunk responses from only lateral flexion to the extension type as well, a definite spread in the reflexogenous areas made its appearance. The most important of the new areas was located in the palmar skin (Fig. 1*B*, 4), stimulation of which caused a quick, partial finger closure. This finger flexion reflex might be limited to the second to fifth digits or might include the pollex (thumb) also. Finger closure might occur alone or accompanied by wrist flexion, wrist adduction, forearm pronation, elbow extension, or medial rotation of the upper arm. It was always ipsilateral until a much older age.

There is reason to believe that, had more cases between nine and one-half and eleven weeks been available, the time at which forearm pronation, arm rotation, and, perhaps, finger closure begin might have been more closely determined. Forearm pronation, elbow extension, and arm rotation have been observed to occur independently of finger closure in response to stimulation over the arm or forearm (Fig. 1*B*, 5), but only in one case (No. 51).

Response to plantar stimulation, though sought during the reactive period of each fetus, was without results except in the oldest of this group (No. 51), where plantar flexion of the toes of the same foot occurred. This appears to indicate that plantar reflexes are later than palmar reflexes in appearance. The same fetus showed certain facial expression responses not observed in any younger fetus, but definitely premonitory of those seen in older individuals.

Eleven and a Half to Twelve and a Half Weeks.—This group consisted of only two completely unanesthetized cases and four others which responded though possibly slightly anesthetized. However, the responses secured indicated a further spread of the reflexogenous areas of the integument and an increase in the repertory of relatively simple, discrete reflexes. These characteristics are clearly preparatory to the well-documented age group next following (thirteen to fourteen weeks) which represents the climax to the development of discrete reflexes and of receptivity of stimuli over the entire integument. Nevertheless, in the eleven and one-half to twelve and one-half weeks group, the responses executed were still mechanical in character and hence to that extent stereotyped, as in all the preceding age groups. A remarkable thing about these responses was that exact repetition of a stimulation in precisely the same area, so far as both are possible of attainment, might result in dissimilar responses. Each response was a complex combination of various components. It has proved impossible to determine why a particular combination of movements might be exhibited, but, once it had been set in process, the resulting response appeared to be inevitable.

The reflexogenous area of the integument here extended over much of the face and of the upper and lower extremities. The sum total of responses involved movement at every joint in the body and in almost every possible mode of movement at each joint. Response to face stimulation was largely by extension of the neck, trunk, and thighs, with some medial rotation of both arms. If stimulation were in the midline, the extension was particularly pronounced, but if lateral a definite component of contralateral neck and trunk flexion was sometimes present. In the twelve and twelve and one-half weeks cases, rotation of the head away from the esthesiometer, accompanied by trunk extension and movement of both upper and lower extremities, was often observed.

The medial rotation of the arms, particularly marked in hyperextensive trunk responses, caused the hands to approach one another in front of the chest, at times so that the finger tips seemed to touch. Stimulation over the lateral acanthus of the eye in one (No. 38) caused a tightening of the as yet unopened eyelids (orbicular contraction). Palmar stimulation evoked partial finger closure. The earliest complete plantar reflex observed in the entire series was seen at eleven and one-half weeks (No. 17). Here plantar stimulation (Fig. 1*B*, 8) caused plantar flexion of the toes and flexion at knee and hip, withdrawing the foot from the esthesiometer.

In general, this age group appears to contain a rather wide variety of activities which may be regarded as marking a definite advance in behavior and as premonitory of the activities of the next group.

Thirteen to Fourteen Weeks.—This group represents the completion of the appearance of discrete reflexes. Except for respiration, grasp, use of the voice, and special sense responses (which have not been tested), the fetus at thirteen to fourteen weeks possesses, in undeveloped form in many cases, most of the basic reflexes of the newborn infant. Furthermore, during the thirteen to fourteen weeks stage, movements exhibited both spontaneously and in response to known stimulation lose their earlier stereotyped character for the most part and become graceful and flowing. The exact age at which this occurs may differ in different individuals.

Although in younger thirteen-week fetuses stimulation in the ventral facial area sometimes initiated trunk and thigh extension, by thirteen and a half to fourteen weeks it almost universally caused a facial grimace, involving the mimetic muscles of the mouth and nose, and eversion of the face or rotation of the upper portion of the body. Stimulation of the eyelids (Fig. 1*B*, 1) caused definite orbicular contraction; if over the root of the nose, an occasional slight scowling movement (contraction of the corrugator muscle) resulted. In several fourteen-week fetuses, stimulation between the lips, especially if repeated, evoked ventral flexion (nodding) of the head and swallowing.

Stimulation on one side of the neck or over one shoulder caused a raising of that shoulder and usually a lateral flexion of the head to that side. When stimulated over the arm, forearm, thigh, or leg, the upper or lower extremity concerned was moved in a wide variety of ways, sometimes involving the trunk, another extremity (usually of the same side), or the head. Palmar stimulation, which seldom resulted in complete finger closure even at fourteen weeks, almost always caused movements of the same arm and forearm, the hand frequently appearing either to follow or to avoid the stimulus. Stimulation over the abdomen and particularly over the sides of the trunk or on the back (Fig. 1*B*, 6) gave rise to wrigglings, some of them quite complicated contortions involving the entire body, which were strongly suggestive of infantile responses to tickling.

At fourteen weeks, almost the only remaining stereotyped reflex occurred in response to plantar stimulation. In some cases it was a true Babinski reflex, consisting of dorsiflexion of the great toe (hallux), dorsiflexion or plantar flexion of the other toes, toe fanning, dorsiflexion of the foot, and flexion at the knee and hip. Though many neonates exhibit dorsiflexion of the toes on plantar stimulation, there appears to be no constancy in the direction of toe flexion in the younger fetuses. Some exhibit plantar flexion almost exclusively, others dorsiflex their toes regularly, and a few may show both types on successive stimulations. This is in accord with the findings of Minkowski (8), who gave special attention to the plantar reflex.

In a few instances, plantar stimulation set up a very widespread response throughout the body. This seems to be indicative of well-developed sensorimotor connections throughout at least the spinal cord and is probably premonitory of the disappearance of the stereotyped character of this reflex, as seen in slightly older stages.

At thirteen and a half to fourteen weeks there is much spontaneous activity; the fetuses seem to be more active and to respond over a longer period than has hitherto been the case. In a period of approximately six weeks, the human fetus has progressed from the more generalized, stereotyped response characteristic of its earliest movements to a group of discrete reflexes which are fundamental to human behavior. The more generalized response has largely, though not entirely, disappeared.

Fourteen and a Half to Twenty-five Weeks.—From about the fourteenth week to birth the development of fetal behavior is largely, though not exclusively, a process of the maturation of those activities which are already present. During much of this period of maturation, the fetus is relatively quiescent, with a higher threshold to stimulation. The number of responses that may be elicited is fewer, and spontaneous movements, though present over a greater proportion of the reactive time, are not frequent. This is especially true of fetuses over twenty-two weeks of menstrual age, when first delivered, but resuscitation completely changes the nature of their behavior. A resuscitated fetus, like the viable premature or neonatal infant, is extremely active spontaneously so long as it is awake and unrestricted by covers, but covering or wrapping it with blankets usually causes a return of quiescence.

One of the most striking phenomena of the movements of fetuses of fifteen weeks and older is the progressive increase in their vigor, as a result of the development of the fetal muscles. An extension of the lower extremities becomes a vigorous kick, a movement of the upper extremity almost a punch. This progressive increase in the strength of the fetus ultimately causes its activities to be felt by the mother. In most pregnancies, the first conscious recognition by the mother of her fetus's activity occurs between the eighteenth and twentieth week. This is the quickening. Either because the fetus is more vigorous or because the mother is more sensitive to its activity, some women may feel fetal movements much earlier than this. As the quickening marks, not the beginning of fetal movement, but its initial perception by the mother, the variation in its occurrence lends credence to the view that much the same movements as those observed in the exposed fetus normally occur *in utero* and have been taking place from the beginning of activity.

Those movements, either spontaneous or reactive, which are observed during the period from fourteen and a half to twenty-five weeks, tend to become progressively more complex, involving more parts of the organism in response to a single stimulation. It is also to be noted that stimulation which in earlier fetuses resulted in largely local responses may often cause movement of relatively distant portions of the body without necessarily evoking any local reaction. Furthermore, repetitive responses increase in frequency. By this term is meant the repetition of the response to a single stimulus, as opening and closing the fingers several times, moving the upper extremity in circles, extending and flexing the lower extremities repeatedly, etc.

At fourteen weeks, stimulation of the mucous membrane of either upper or lower lip caused closure (tightening) of the lips, often accompanied by turning or extension of the head. By seventeen weeks, stimulation of the mucous membrane of the lower lip evoked lip closure, but of the upper lip resulted in protrusion of that lip. By twenty and a half weeks, both lips were protruded on such stimulation, either to a single lip or to both together, and a smooth glass rod placed between the lips caused a suctorial response, though without effective suction.

Contraction of the orbicularis oculi muscle, which squints or tightens the eyelids, was evoked at twelve weeks by stimulation of the lateral angle of the eye; by fourteen and a half weeks only in response to gentle stroking over either eyelid; from fifteen to twenty weeks by this stimulation or by stroking the upper lip near the nose, but after twenty weeks only by stimulation vertically over the center of both lids or of the upper lid alone. At fourteen weeks, stimulation near the root of the nose evoked a slight scowl. Scowling frequently accompanied orbicular contraction by fifteen weeks and could be elicited by stimulation of almost the same area.

At eleven weeks, palmar stimulation evoked partial finger closure; by thirteen to fourteen weeks finger flexion was accompanied by movements of the upper extremity, and by fourteen and a half weeks complete finger closure, in addition to the other movements, became the usual form of the response. Though capable of movement almost from the beginning of finger closure, the pollex is relatively inactive until after birth. Grasping, as distinguished from finger closure, is possibly present as early as fifteen weeks, is fairly effective by twenty and a half weeks and vigorous by twenty-five weeks. It is interesting to note that the grasp of one twenty-seven-week premature infant was sufficiently strong to support its weight with one hand momentarily and that neonates (forty weeks) are fairly regularly able to do so.

What might be interpreted as preliminary respiratory movements of the chest were observed at eighteen weeks, but the youngest fetus in this series observed to breathe and cry was twenty-two weeks old. From twenty-three and a half weeks on, fetuses may be resuscitated and will live for a time, but the youngest definitely viable premature seen was twenty-seven weeks old. This is quite early. It is, of course, evident that only a respiring fetus or premature infant is capable of using the vocal cords. Though the term "crying" is used, no tears are produced.

The abdominal reflex (Fig. 1*B*, 7) appeared by fourteen and a half weeks and was quite constant by twenty and a half weeks. One twenty-five week fetus gave a typical Moro or startle reflex on being quickly lowered into its bed.

The spontaneous movements of resuscitated fetuses have an almost infinite variety. In some, from twenty-five weeks on, certain of the hand movements are reminiscent of greatly exaggerated intention tremors, being rapid and clonic. Tendon reflexes, though sought from fifteen weeks, were not observed before twenty-five weeks and then only after the fetus was respiring satisfactorily following resuscitation.

It will thus be noted that, by twenty-five weeks of menstrual age, the fetus has enlarged its repertory of activities present at fourteen weeks by a number of fundamental reflexes. Among these are respiration, grasping, use of the vocal cords, and the suctorial reflex. Added to those present 11 weeks earlier (bearing in mind that special sense perception and reflexes, except touch, are omitted from consideration), the twenty-five-week fetus is equipped with practically all the activities basic to postnatal existence, though most, if not all, require further maturation. At this age, the physiological aspect of development appears, though falsely, to have outstripped the structural. The fetus is capable of respiration, but the muscles involved are weak and the lungs still lack sufficient capacity to fill the expanded chest. The added load of extrauterine life often overtaxes the circulatory system. The suctorial reflex is present, but the fetus lacks the muscular strength necessary to secure sufficient food by this means. During the next 15 weeks of normal intrauterine existence, the maturation of both structure and function required for postnatal life takes place.

Summary

The results of these studies indicate that the human fetus begins to respond to external stimulation probably during its eighth week of menstrual age. The area of the skin sensitive to tactile or any other form of external stimulation appears to be restricted at this time to the region of the mouth and nose. The earliest response observed involved contraction of the lateral, usually contralateral, musculature of the neck and trunk, and that from the trunk to the limb girdles. The reaction exhibited is stereotyped but fully integrated. The fetus moves only in response to some recognizable form of external stimulation.

In the subsequent development of fetal activity, the earliest movements spread caudally to become more marked in the region of the lower trunk. Then discrete reflexes appear, accompanying spread of the skin areas sensitive to stimulation. By fourteen weeks, possibly earlier in some cases, the fetus has largely ceased to exhibit the earlier more generalized response, almost all the activities shown have ceased to be stereotyped, and the behavior of the fetus is based upon an infinite variety and combination of delicate discrete responses. By twenty-five weeks, the few remaining reflexes, essential for postnatal life and not present by fourteen weeks, have appeared. The maturation of the various specific reflexes has been progressing following their appearance but is still incomplete. Only those reflexes required at birth will be fully matured at term, for the development of human behavior continues long after that event.

This brief account of the development of human fetal activity indicates that there is a normal, progressive evolution of behavior in the human fetus. Furthermore, the development of fetal behavior lays a necessary foundation for the later development of postnatal behavior, so that the latter is not merely imposed upon the former, but arises from it by a process of further maturation of already existing activities.

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CHAPTER III

THE ACTIVITIES OF NEWBORN INFANTS*

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Introduction

The Problem.—In previous investigations of infant reactions the effects of varying external stimuli such as light, sound, taste, odor, and temperature were studied. No one had attempted to find out what the amount and nature of infant reactions might be when these external stimuli were not present or, if they were present, were rendered constant. Accordingly the present investigation undertook to investigate infant activities throughout a continuous, or nearly continuous, 10-day period following birth, during which these external stimuli were maintained approximately constant. This procedure may be designated as the continuously controlled method of studying reactions. Since the external influences are maintained at an unvarying level of intensity, it is assumed that the activities of the infants are due largely to stimuli arising within the body of the infant itself.

This type of day-and-night observation is a task which can be accomplished only by the cooperative effort of several individuals. An elaborate schedule had to be prepared to fit the convenience of the experimenters. Substitutes had to be provided against the possibility of unavoidable absences of experimenters. Apparatus frequently had to be checked to be kept in continuous working order. A group of clerical workers was organized to transcribe data (about 5 miles of recording tape were analyzed). Then, the actual task of observing continuously is tedious work, and long before an infant's ten-day period was completed it became burdensome.

These circumstances put a limit on the number of cases which could be observed. Five infants were completed, the first of which was used for training experimenters, developing techniques, and testing apparatus. Consequently, only the data gathered on the remaining four cases have been included in the study. The writer is aware, of course, that the fewness of cases means that the results and conclusions which have been suggested possess only limited validity. More cases† must be observed by the continuously controlled method before reliable statements can become established. Moreover, the fewness of cases observed renders an elaborate and refined statistical treatment irrelevant. The present results have been cast into tabular form and illustrated with occasional charts.

Several problems are involved in an investigation of the externally uninfluenced behavior of newborn babies. These are (*a*) the amount of activity exhibited by the infants, (*b*) the nature of the reactions, and (*c*) the localization of the internal stimuli. It is the purpose of this study to approach the first two of these problems.‡

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* From a monograph, The amount and nature of activities of newborn infants under constant external stimulating conditions during the first ten days of life, *Genet. Psychol. Monogr.*, 1930, **8**, No. 1. Pp. 92, with permission.

† In a subsequent study (6) the activity of over 70 infants has been measured and a number of the results suggested by the present study have been confirmed.

‡ In a subsequent study by Richards (16), at the Iowa Child Welfare Research Station, the third problem has been studied.

Apparatus and Techniques.—Measuring the amount of activity in which an organism indulges requires some kind of device upon which the activity may be impressed and a second device which will give a quantitative record. The stabilimeter and the polygraph* are such devices. Since the object of the experiment was to measure behavior while the external stimulating influences are kept constant, a third device was necessary. This is the experimental cabinet. The cabinet used in this study is a modification of one first built by Pratt (14). It is a box about 5 ft. long, 3 ft. wide, and 4½ ft. high. It contains the stabilimeter and such instruments and devices as are necessary to control temperature, humidity, light, sound, odor, taste, etc.

The stabilimeter upon which the infant lies is built upon a horizontal position. The movements of the infant are translated over a string-and-pulley system† to pens which record oscillations on the moving tape of the polygraph, which is supported by a shelf at one end outside the cabinet. Above the polygraph is an observation window giving a full-length view down upon the infant at a 45-deg. angle. The infant lies on a soft pad on the stabilimeter, with its feet toward the observation window. A platform, which raises the experimenter to the level of the window, supports a chair, enabling him to sit comfortably during the periods of continuous observation.

The Control of Stimuli.—It is assumed that the activities of infants under the conditions of this research are due to stimuli originating within the body of the infant. This assumption is made on the grounds that external stimuli are controlled so that they remain constant, or approximately constant.

The cabinet is illuminated by a 25-watt blue frosted bulb which provides a soft light. At the level of the infant's face the illumination is 0.21 foot candles. The matter of adaptation of the ciliary muscles of the experimenter's eyes to the dim light of the cabinet is facilitated by throwing the light from a similar bulb upon the moving tape of the polygraph. Temperature is controlled by setting a Marvel thermostat at any desired reading of the thermometer; with the exception of certain unusual conditions, it was maintained at 84°F. Occasionally, when the feet of the infant felt cold to the hand, the temperature was increased. The curtain arrangement at the front of the cabinet rendered it difficult to control sound, but the situation of the research room was a favorable factor.

The Method of Observation

The Infant.—Infants were placed on the stabilimeter as soon after birth as possible. Each wore an abdominal bandage and navel dressing, a diaper, and a light undershirt. Five infants were used as subjects, one of which served for preliminary purposes of working up technique and for the training of experimenters.

Observation and Nursing Periods.—The nursing schedule is an important factor in the behavior of infants. They were fed according to the following schedule: 1 P.M., 4 P.M., 7 P.M., 10 P.M., 6 A.M., and 10 A.M.

It will be seen from this schedule that nursing periods occur every 3 hr. during the day. The length of the nursing period varied from ½ to about 1 hr., depending upon the number of infants to be attended in the nursery and the number of available student nurses. During the night two nursing periods were omitted and the early-morning period was advanced 1 hr. The observation period is the time between nursing periods when the infant was in the experimental cabinet. It was somewhat variable in length, at night lasting about 7½ hours. Five minutes before the time indicated on the nursing schedule the infant was wheeled from the research room to the nursery.

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* The stabilimeter was first devised by Szymanski (17) and has had extensive use in physiology and comparative psychology. Pratt, Nelson, and Sun (14) modified it for use with infants. The polygraph is a continuously running kymograph. Renshaw and Weiss (15) designed it for recording human activity.

† In subsequent studies an electrically controlled stabilimeter was used. It is much more sensitive than the one used in this study.

The Experimenter.—The training of the experimenter is an important part of the technique of observation. The experimenter was required to memorize a list of symbols denoting the reactions of infants. Obviously the fundamental skill in observing is the ability to recognize promptly in terms of the symbols any movements as they occur. Three procedures were relied on to develop these habits: (*a*) an explanatory sheet describing the reactions was studied by each experimenter; (*b*) a new experimenter watched the infant's activity and at the same time noted the recording of this activity by an experienced recorder who explained why he used any given symbol; (*c*) the beginner was seated at the polygraph and received the dictation of symbols from an experienced recorder while both observed the infant.*

The Measures of Activity.—The measures of reactions of infants are twofold: (*a*) the frequency of segmental movements† as observed and recorded on the polygraph tape by the experimenter; (*b*) the stabilimeter activity as recorded automatically as oscillations on the polygraph tape by the mechanical pens. This provides an index of the amount of the infant's activity. It was therefore possible to measure the reactions either in terms of the kind of activity or in terms of pen oscillations. In turn, the amplitude or the frequency of oscillations might serve as the measure of activity. In view of the large number of oscillations which were recorded by the two mechanical pens and the fact that a considerable clerical staff was necessary to measure and transcribe oscillations on about 5 miles of polygraph tape, the problem of amplitude or intensity was disregarded and the frequency of oscillations was taken as a measure of the automatic activity.‡

Three ratios or indexes are employed in the tables of results: (*a*) percentage of frequency of movements: (*b*) movements per unit time (minute, hour, observations period, day); and (*c*) oscillations per unit time of mechanical pens. The first two ratios are based upon the observer's record; the ratio of oscillations per unit time is based on the mechanical record. *Percentage of frequency of movements* means, for example, that of all movements in a given unit of time the leg movements are a certain percentage. To illustrate:

$$\frac{3 \text{ leg movements}}{68 \text{ total movements}} = 4 \text{ per cent}$$

Movements per unit time means that a given number of movements occurred at the rate of, say, 35 movements in 1 hr. *Oscillations per unit time* means that a given number of mechanical pen movements occurred at the average rate of, say, 36 oscillations per minute on the fifth day for infant 1. An oscillation is defined as an excursion and return of the pen on the polygraph record.

Recording and Classifying the Data. Five types of data records were used for gathering and classifying the data: (*a*) the polygraph tape; (*b*) a tally sheet; (*c*) a 10-min.-totals sheet; (*d*) a final-totals sheet; (*e*) mass-activity sheet.

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* This part of the experiment may be criticized, because observer reliabilities were not reported.

† This is defined and exemplified on p. 32.

‡ The reading of oscillations always was carefully checked. In subsequent studies employing over a dozen checkers the reliabilities consistently exceeded 95 per cent.

The Polygraph Tape.—The polygraph tape carried the record of the two mechanical pen oscillations and a descriptive record of the segmental movements of the infant in terms of a code of symbols. In addition, there were noted on the tape the name of the subject, the date and time of observation, the conditions within the experimental cabinet, any incidents occurring during the nursing period, and any unusual conditions which arose, such as extra feeding and visits of physicians and nurses. At the beginning of each 10-min. period the conditions within the cabinet were carefully checked and noted on the tape.

Explanation of Symbols. *General Body Movement.*—The following is a detailed description of segmental and body movements as they are indicated by the polygraph symbols. Only the more important movements are included. This explanatory list was placed in the hands of each observer during the training period.

*B*1—rolling: The body moves from lying on the back to lying on either side. It is usually a rapid movement and is repeated, although it may consist of one turn.

*B*2—squirming: In this reaction a number of activities proceed. The trunk is twisted, usually slowly; the arms, legs, hands, and fingers may be involved in slow, indefinite movements. The outstanding tests for this symbol are slowness and vagueness of movement; yet, nevertheless, because the whole infant is involved, it is difficult to analyze. It is an incipient *B*5 and appears in the early stage of mass activity.

*B*3—stretching: The trunk is tensed, the arms are reached overhead, and the legs are extended.

*B*4—rapid breathing: During this reaction an increase in the rate of respiration occurs, plainly observed in the abdominal rise and fall.

*B*5—continuous body activity: This symbol is used when activity is both so continuous and so rapid that the observer cannot analyze it and record it on the tape fast enough to keep up with the infant. It is almost always accompanied by crying. *B*5 indicates mass activity in its most striking aspects. Observers, when they first learn to record, attempt to analyze this activity, but, of course, are unable to do so adequately.

*B*6—quick body jerk: This takes the form of a sudden tensing of trunk muscles. The hips and legs are quickly flexed. Likewise the arms are flexed and hugged to the chest. Often the opposite reaction occurs. That is, arms and legs may be suddenly extended. As in *B*2 and *B*5, in *B*6 all segments of the infant participate in the reaction.

Arms, Legs, Hands, and Feet.—The following is a detailed description of movements of the arms, legs, hands, and feet as they are indicated by the polygraph symbols. Only the more important movements of the list are included. This explanatory list was also placed in the hands of each observer during the training period.

1—extension: This activity is a straightening or an unbending of the arms at the elbow and is an unbending of the legs at the knees.

2—flexion: This means bending at joints. When it is of the arms it is a bending at the elbow so that the forearm and upper arm form an angle. When it is of the legs it is a bending at the knee so that the lower leg forms an angle with the upper leg. Hip flexion is the drawing up of the knees to the trunk.

3—slashing: This activity is confined to the arms. They move rapidly in any direction from the shoulder and involve both flexion and extension.

4—kicking: This activity is confined to the legs. It consists of rapid and continuous extensor thrusts alternating with flexions of a somewhat exaggerated type. The legs usually alternate as in pedalling, but sometimes the two legs are extended and flexed together. Slashing and kicking are more complicated than simple extension and flexion, for they are more or less continuous, rapid, and exaggerated. These reactions represent transitional stages between specific segmental movements and mass activity.

9—fanning: This is a slow movement of the fingers or toes.

10—trembling: A slight quivering of a segment.

11—jerking: An exaggerated trembling of a segment.

13—over chest: A movement in which the arm is thrown over the chest. It may or may not involve flexion at the elbow.

15—adductions: This is a movement of a limb toward the median axis. The arm moves from the shoulder with the elbow straight. The leg moves from the hip with the knee straight.

16—abduction (opposite of adduction): This is a straight arm or leg movement away from the median axis.

17—rotation: This is a turning of a member at right angles to a hypothetical straight line down the center of the member.

18—hip rolling: This is a rolling to the right or to the left of the hips. It may or may not involve flexion of the leg. The trunk is not involved.

For the purposes of the present study all the movements which have been observed have been classified into five groups: head, body, arms, legs, and sounds. This classification will be used in the tables which report the frequency of movements.

Head movements include the following: head to right, to left, head drawn back, mouth open and closed, pursing lips, licking lips, eyes closed and opened, lids tightened. *Body movements* are: body rolling, squirming, stretching, rapid breathing, general body movements, quick body jerk, shudder, gasp, arched back, and organic disturbances. In some of these body movements the effect includes one or more of the extremities. For example, in a body jerk the musculature both of the extremities and of the trunk is affected. Likewise both trunk and extremities move in *B*2 and *B*5. In respiratory movements, on the other hand, only the trunk is involved and not the extremities. However, when breathing becomes very rapid, the trunk activity will irradiate into the extremities. Therefore, the term "body" has been used in place of the term "trunk" to indicate this class of movements. The group of *arm movements* includes not only gross arm movement but also that of the smaller segments, the hand and the finger. The specific movements of these segments are: extension, flexion, adduction, abduction, rotating, waving, slashing, jerking, and trembling. Similarly, *leg movements* include movements of the whole leg, as well as of the feet and toes. *Sounds* include crying, coughing, sneezing, smacking lips, sucking sounds, choking noises, hiccoughing, whimpering, sighing, audible breathing, throat sounds, vocalizing, and the hunger cry. Moreover, it will be noticed that there is some overlapping between groups. For instance, coughing is both a sound and a movement. In such cases both are recorded under the appropriate classification.

Mass Activity.—Mass activity is a behavior category which refers to activity involving the whole infant (including all extremities), as opposed to activity involving specific segmental movements. Mass activity is represented by combinations of certain symbols. These combinations are as follows:

*B*5 —continuous general activity.
*B*5*S*1 —continuous general activity with crying.
*B*5*S*11—continuous general activity with whimpering.
*B*5*S*14—continuous general activity with throat sounds.
*B*5*S*15—continuous general activity with hunger cry.
*B*6 —body jerking.
*B*6*S*1 —body jerking with crying.
*B*6*S*11—body jerking with whimpering.
*B*6*S*14—body jerking with throat sounds.
*B*6*S*15—body jerking with hunger cry.
*B*2 —body squirming
*B*2*S*1 —body squirming with crying.

*B*2*S*11—body squirming with whimpering.
*B*2*S*14—body squirming with throat—sounds.
*B*2*S*15—body squirming with hunger cry.

Data and Results

General Data.—The general data on the four infants are included in the first three tables. These comprise hours on stabilimeter, recorded movements, and total oscillations.

TABLE 1.—HOURS ON STABILIMETER ON SEPARATE DAYS FOR ALL INFANTS*

Age, days†	Infant			
	1	2	3	4
0 to 1	15.45	14.84	14.35	16.06
1 to 2	17.88	16.77	16.42	19.06
2 to 3	18.56	16.96	17.76	18.14
3 to 4	17.75	15.23	18.53	17.88
4 to 5	17.48	15.92	17.39	18.07
5 to 6	15.96	17.60	18.03	17.79
6 to 7	17.77	17.80	13.97	18.21
7 to 8	15.92	16.53	17.61	17.96
8 to 9	17.33	16.27	17.78	17.93
9 to 10	16.82	17.72	18.65	16.93

* *Hours on stabilimeter*, the actual time in hours the infant remained on the stabilimeter each day.

† *Age, days*, age of infant; the first day includes the first 24 hr. after birth; the second day the first 48 hr., etc. In the remaining tables 0 to 1 will be stated as 1, 1 to 2 as 2, etc.

Table 1 gives the number of hours each day each child was observed. In Table 2 may be found the number of reactions for each infant by days which were recorded by the observer. Table 3 gives the total oscillations per day of each of the four infants.

Results.—The results of this study are reported in the terms of the frequency and per cent of segmental movements as recorded by the observers, average movements per hour as recorded by the observer, and oscillations per minute as recorded by the stabilimeter-polygraph mechanism. These results are found in Tables 4, 5, and 6, and in the figures.

Table 4 presents the data in Table 2 in terms of the percentage of frequency of segmental movements. The body segments referred to are the head, the trunk, the arms, and the legs. Sounds are also included in this table.

The table reveals that the percentages of head movements for the four infants increases with age from 3 per cent on the first day to 6 or 7 per cent on the last 3 days. For movements of the trunk the value is 19 per cent for the first day and thereafter averages about 30 per cent. The highest per cent is 34 on the ninth day. There is a slight decrease of arm movements from 22 per cent on the first to 18 per cent on the

TABLE 2.—NUMBER OF RECORDED MOVEMENTS ON SEPARATE DAYS FOR ALL INFANTS

Age, days	Infant				Average
	1	2	3	4	
1	2,222	1,688	1,206	1,731	1,712
2	3,102	1,694	856	1,272	1,753
3	3,076	1,707	502	1,772	1,764
4	2,772	1,198	987	1,512	1,617
5	2,627	1,145	1,595	690	1,514
6	2,181	952	838	813	1,196
7	1,335	728	1,364	1,054	1,120
8	2,114	1,085	1,248	1,305	1,438
9	1,841	1,335	780	800	1,189
10	1,482	1,287	991	962	1,181
Total........	22,752	12,809	10,357	11,911	

tenth day, with a high point on the third day and lows on sixth and eighth days. There is a decrease of leg movements from 42 per cent on the first day to about half at the end of the 10-day period. There is an increase of sounds from 14 per cent on the first day to 23 per cent on the last. The average per cent of movements of the segments for all infants for the entire 10-day period is 4 per cent for the head, 28 per cent for the trunk, 21 per cent for the arms, 30 per cent for the legs, and 17 per cent for sounds.

It may be concluded from the data in Table 4 that the greatest per cent of increase occurs in trunk movements, the greatest decrease occurs in leg movements. Generalizing, one may conclude that for these infants at the end of 10 days the movements of the anterior parts of the body are gaining in dominance over those of the posterior.

TABLE 3.—TOTAL OSCILLATIONS PER DAY ON SEPARATE DAYS FOR ALL INFANTS*

Age, days	Infant				Average
	1	2	3	4	
1	7,683	23,289	8,089	4,444	10,876
2	19,608	24,904	15,787	7,819	17,029
3	19,128	45,067	5,803	10,548	20,136
4	23,298	61,061	9,682	31,963	31,501
5	37,934	36,688	39,611	37,768	37,975
6	47,272	42,956	34,632	52,566	44,356
7	34,414	68,880	30,059	32,764	41,529
8	19,398	36,850	51,456	48,734	39,109
9	19,827	33,335	23,778	46,170	30,777
10	34,585	67,252	35,975	44,193	45,501
Total........	263,147	440,282	254,872	316,969	

* Oscillations per day, total oscillations of pens during actual time each day infants were on stabilimeter.

TABLE 4.—FREQUENCY OF SEGMENTAL ACTIVITIES ON SEPARATE DAYS FOR ALL INFANTS

Age, days	Head		Trunk		Arms		Legs		Sounds	
	Frequency	Per cent	Frequency	Per cent	Frequency	Per cent	Frequency	Per cent	Frequency	Per cent
1	199	3	1,325	19	1,498	22	2,889	42	936	14
2	265	4	1,999	29	1,344	20	2,145	31	1,058	16
3	233	3	1,437	21	1,730	25	2,530	35	1,107	16
4	182	3	1,716	29	1,231	21	1,658	27	1,178	20
5	303	5	1,650	27	1,390	23	1,889	32	807	13
6	253	5	1,542	32	815	17	1,354	29	815	17
7	206	5	1,415	32	929	21	1,086	23	839	19
8	324	6	1,760	31	965	17	1,591	27	1,113	19
9	335	7	1,623	34	932	20	989	20	887	19
10	265	6	1,435	30	873	18	1,062	23	1,084	23
Average percentage..		4	.....	28	.....	21	.....	30	.....	17

When the second measure of activity, movements per hour, is used, the data may be seen in Table 5. These values represent a recasting of the data in Table 4.

Table 5.—Average Movements per Hour on Separate Days for All Infants*

Age, days	Head	Body	Arms	Legs	Sounds	Total
1	3	20	23	44	15	105
2	4	29	21	39	16	109
3	3	21	24	36	14	98
4	5	25	13	18	13	74
5	5	22	20	27	13	87
6	4	25	12	20	12	73
7	3	21	14	17	13	68
8	5	26	13	24	17	85
9	5	27	14	15	13	74
10	4	18	14	20	17	73
Average.....	4	24	17	26	14	

* *Movements per hour*, the number of movements per hour computed on a 24 hr. day basis.

The percentage of frequency and movements per hour are measures based upon the records of the observers. Oscillations per minute refer to measures of activity made automatically by the mechanical pens of the polygraph. These values are tabulated in Table 6 and the average oscillation per minute per day is presented graphically in Fig. 1.

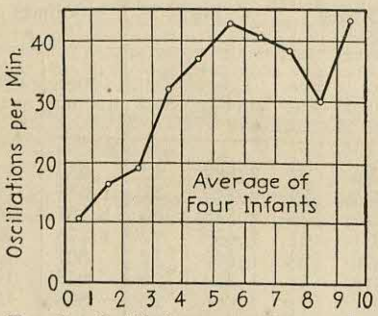

Fig. 1.—Oscillations per minute. (*From Genet. Psychol. Monogr.*, 1930, **8**, *No.* 1, *p.* 44.)

It will be seen from the chart that in general there is an increase in oscillations per minute from the first to the tenth day for each of the four infants. Oddly enough there is a drop in the amount of activity on the ninth day.

A matter of considerable interest concerns the question: how does activity vary throughout each day of the 10-day period? The situation is exhibited in Figs. 2*A* and 2*B*, which indicate the average number of oscillations per minute of the four infants for each successive 2-hr. period of the 10 days. It is seen that activity is quite low during the first few days. There is a gradual increase during the first 5 days. From the sixth day on, activity is at a

Table 6.—Oscillations per Minute on Separate Days for All Infants*

Age, days	Infant				Average
	1	2	3	4	
1	8	21	9	5	11
2	19	24	16	7	17
3	17	44	5	10	19
4	22	67	9	30	32
5	36	38	38	35	37
6	49	41	32	49	43
7	32	65	36	30	41
8	20	37	49	45	38
9	20	34	22	43	30
10	34	63	32	44	43
Average ..	26	43	25	30	31

* *Oscillations per minute*, the number of oscillations per minute computed on a 24 hr. day basis.

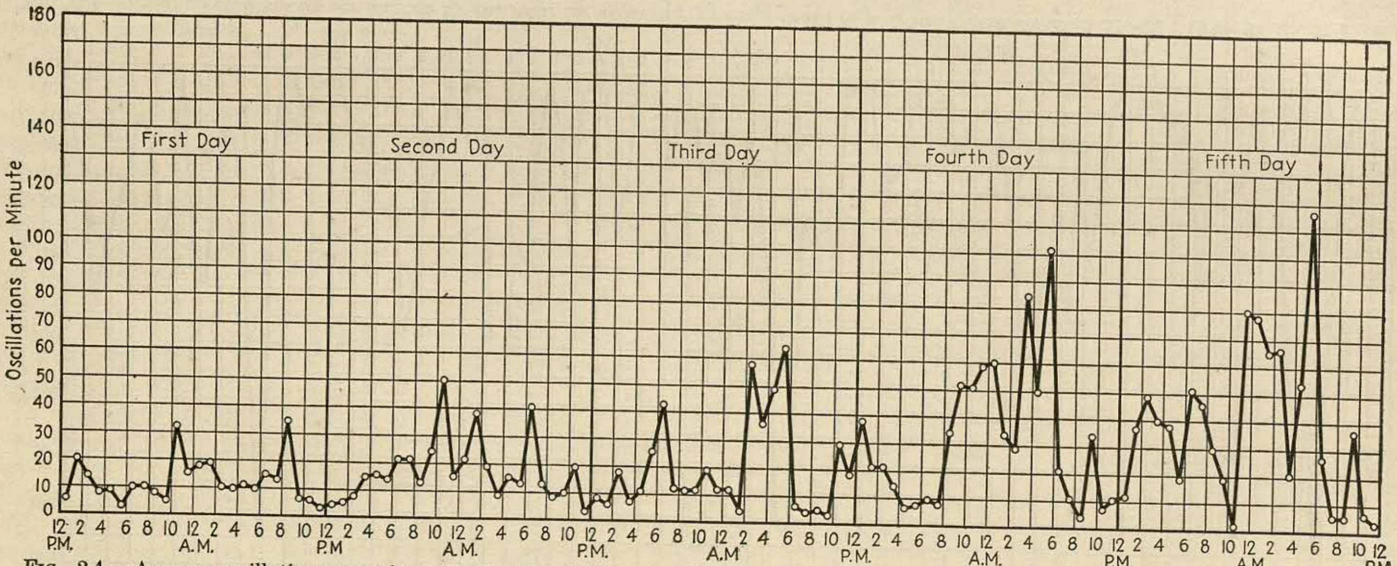

FIG. 2A.—Average oscillations per minute by the hour for first day through fifth day. (*From Genet. Psychol. Monog.*, 1930, **8**, *No.* 1, *p.* 46.)

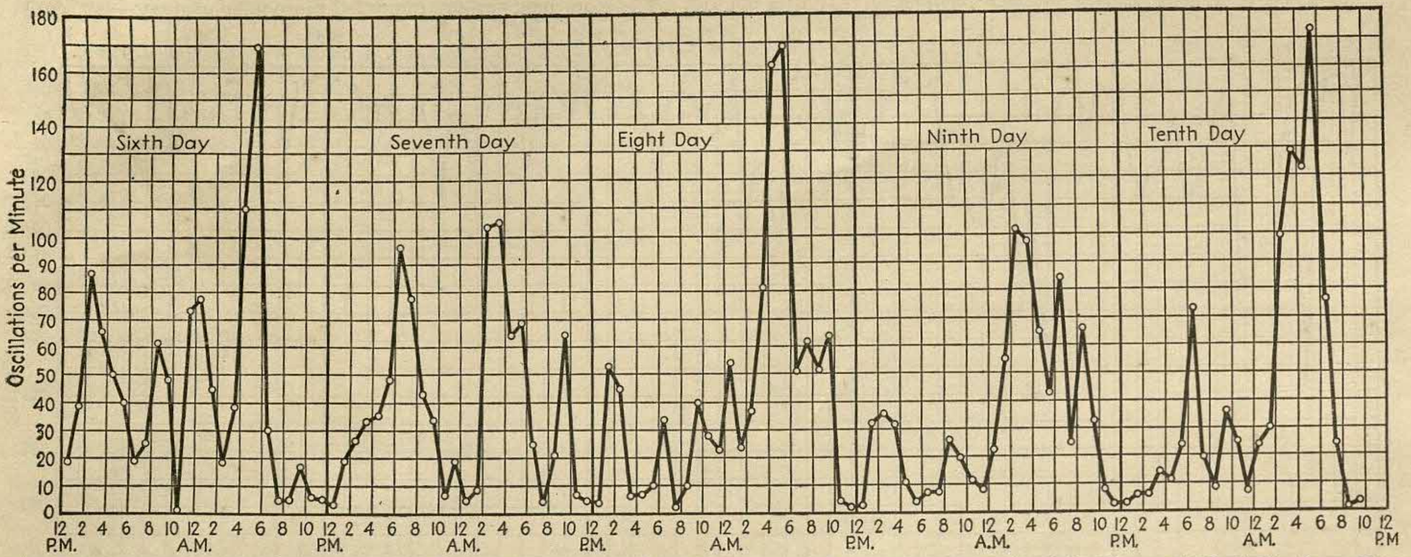

FIG. 2*B*.—Average oscillations per minute by the hour for sixth day through tenth day. (*From Genet. Psychol. Monog.*, 1930, **8**, *No.* 1, *p.* 46.)

maximum. It is to be noted that within each day there are great variations in the amount of activity. When it is remembered that external conditions which might influence the behavior of the infants have been kept constant, this is of especial importance because it indicates that internal factors must be exceedingly potent in their influence upon the amount of activity in which a baby indulges during the course of the day. One item particularly stands out. After the third day, during each forenoon period a peak of activity is increasingly evident in the chart. This situation quite readily may be correlated with the fact that during this period the regular feeding is omitted. It may therefore be inferred that an unusual internal condition has developed, presumably that of hunger.

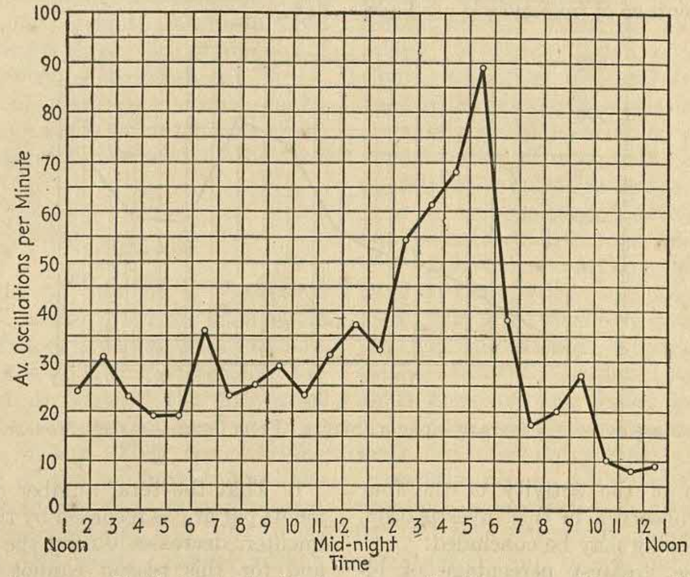

Fig. 3.—Average oscillations per minute of corresponding hours—combined results for four infants. (*From Genet. Psychol. Monogr.*, 1930, **8**, *No.* 1, *p.* 47.)

The matter is more clearly illustrated in Fig. 3, where all 10 days' activity have been superimposed upon each other so as to give a picture of the distribution of amount of activity from noon to noon. After the 1 A.M. feeding, activity steadily rises until the next feeding at 5 A.M., one nursing having been omitted. After the 5 A.M. feeding, activity drops precipitously. The chart thus gives convincing evidence that even if external conditions are maintained constant the internal or organic condition of the organism is a powerful factor in influencing behavior.*

Mass Activity.—An outstanding feature of this study was the enormous amount of activity in which the infants engaged. At the outset this had not been expected. In fact, ordinary experience in the home with newborn infants does not seem to justify this finding, for in the home the infant is dressed and covered with bedclothing, which hampers movements. This condition did not exist in the experimental cabinet.

Earlier in this chapter a distinction between specific movements and mass activity was indicated. A sampling of 100 records of mass activity of the four infants amounting to about 13 hours' duration was analyzed by days in order to learn of its distribution during the 10-day period. The result may be seen in Fig. 4 in terms of oscillations per minute.

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* This matter has been experimentally pursued by Richards (16).

It is seen that mass activity increases progressively throughout the 10 days with a drop and recovery toward the end of the period.

Summary of Conclusions.—When the percentage of frequency is used as a measure of the activity of the four infants observed in this investigation, the following may be concluded:

1. The greatest percentage of increase in segmental activity during the 10 days occurs in body movements.
2. The least percentage of increase occurs in head movements.
3. The greatest percentage of decrease occurs in leg movements.
4. There is an increase in the use of vocal mechanisms.
5. Arm movements remain about constant.
6. There is an increase in dominance of the anterior segmental activities over the posterior at the end of ten days.

When the number of movements per hour is used as a measure of activity, it is found:

1. That this measure does not confirm the first measure by showing the greatest increase to occur in body movements.
2. That it does confirm a slight increase in head movements.
3. That it confirms the first measure in regard to a striking decrease in leg movements.
4. That both measures show an increase in sounds.
5. That it confirms the first measure in showing a dominance of anterior over posterior activities on the tenth day.
6. That the total number of movements per hr., as recorded by the experimenter, decreases during the 10 days and for this reason cannot be considered as reliable a measure as the percentage of frequency, which indicates what fraction of the total daily movements any given segmental movement is.

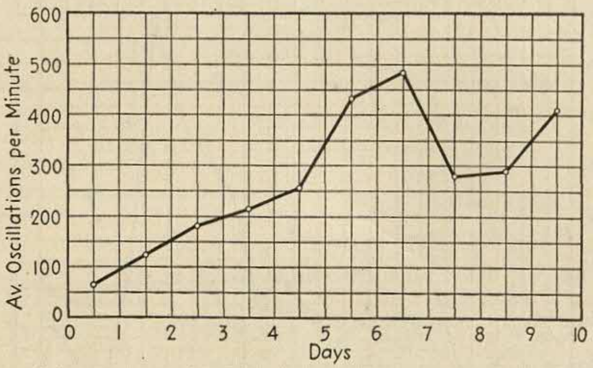

Fig. 4.—Mass activity—average for four infants. (*From Genet. Psychol. Monogr.*, 1930, **8**, *No.* 1, *p.* 52.)

When the number of oscillations per unit of time is used as a measure of the activity of the four infants observed in this investigation, the following may be concluded:

1. Infants are more active just before than just after nursing.
2. They are least active about noon.
3. They are most active early in the morning.
4. They are most active on the tenth day.
5. They are least active on the first day.

When the number of oscillations per minute are determined for 100 samplings of mass activity, the following may be concluded:

1. Mass activity is strikingly characteristic throughout the first 10 days.
2. Mass activity is at its minimum on the first day.
3. It is at its maximum on the seventh day.
4. There is a decrease in mass activity on the eighth and ninth days.
5. There is a recovery of amount of mass activity on the tenth day.

Some of these conclusions are included as a series of statements which are more fully discussed in the next section.

Discussion

In order to establish a theoretical approach to the problems involved in the continuous observation of newborn infants, the following statements are advanced. In view of the fewness of cases, these generalizations are of a tentative nature. They are: (*A*) the behavior of the newborn infant falls into two descriptive categories—(*a*) specific movements and (*b*) mass activity; (*B*) when external stimuli remain constant, the stimuli which initiate the activity are of the interoceptive type, very probably localized in the alimentary tract; (*C*) when external stimuli remain constant, well-integrated behavior patterns are infrequent; (*D*) the behavior of the newborn is gradually speeded up as soon as the change from placental to alimentary feeding becomes well established; (*E*) there is an increase of dominance of anterior over posterior segments at the end of the 10 days; (*F*) vocal sounds are at first components of mass activity; (*G*) the earliest beginnings of social behavior arise out of mass activity and crying; (*H*) mass activity, probably, is the consequence of neurological immaturity of the newborn infant; and (*I*) this study has some bearing on the formation of a concept of development. Each of these statements will be developed briefly.

*A. The behavior of newborn infants falls into two descriptive categories: specific movements and mass activity.** By a specific movement is meant a segmental activity. Examples of this are rolling the head, flexion of knee or elbow, extension of legs, etc. Frequently the activity involves more than a single segment in a crude, ungainly amalgamation of movements, and frequently the whole organism is at work in an amorphous mass of activity. The body squirms, twists, rolls, and bends. The back arches, the hips sway, the head rolls from side to side or is thrown back. The arms slash vigorously and the legs are kicked in exaggerated extensor thrusts or are flexed sharply at ankle, knee, and hip. Hands, feet, toes, and fingers are in continuous movement. Sucking and smacking sounds frequently occur, while loud crying usually is coincident with mass activity. All this activity is more or less simultaneous and comes and goes in periodicities. There is an exaggerated diffuse amorphous character to this behavior. The normal precision and refinement which mark adult reactions are not present. The criteria of specific behavior are: (*a*) it involves a localized or segmental region of the organism, and (*b*) it exhibits precision and nicety of movement. The criteria for mass behavior are: (*a*) the organismic character, *i.e.*, the whole body or a large part of the body, including many or all segments, are involved, (*b*) an irradiating amorphous character or lack of precision and fine coordination, (*c*) an exaggerated or excessive movement.

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* A criticism which has been leveled against this study assumes that the behavior of newborns is exclusively of a mass nature. That there is also a category of specific reactions is expressly stated.

Mass activity and specific movements, however, are not to be rigidly considered as contradictory or as mutually exclusive categories. Mass activity may include also segmental movements which are incorporated in an amorphous manner.*

B. The stimuli which initiate activity when external conditions remain constant are probably interoceptive in nature. It is not assumed that external stimuli are inoperative; it is merely suggested that they are fairly constant. The justification for the assumption that the stimulation is internal is that activity is greatest during hunger, bowel evacuation, intestinal disturbances, regurgitation, and occasionally preceding micturition. It usually, as the data show, is greatest before the nursing period and least after it. It is a fair assumption, therefore, that the activity is due to stimuli arising internally while these processes go on. Richards (16) recently in our laboratory has systematically investigated this matter. He has induced newborns to swallow thin rubber balloons which are then inflated so as to be subject to the hunger movements of the stomach. These inflated balloons are hooked up with a polygraph and the hunger contractions and body activity are simultaneously recorded on polygraph tape. He concludes that the hunger contractions are not the cause of body activity, but rather that both are the results of some metabolic condition present during hunger, perhaps sugar deprivation in the blood stream.

C. When external stimuli remain constant nonamorphous integrated behavior patterns in infants are infrequent. Such physiological reflexes as are involved in respiration, circulation, and digestion, of course, are not referred to here. Rather the statement has reference to behavior of peripheral muscle systems. While such types are few in number they are not altogether absent. Sucking perhaps is the outstanding example of an integrated pattern, and the nicety and economy of the part movements of this pattern contrast with the exaggerated crudeness of the more amorphous massive behavior described above. Another behavior pattern which is present in newborns during the first 10 days of life is a characteristic posture when the infant lies asleep upon its back (see 10, 19). The head may be turned either to the right or to the left, the upper arms extending evenly from the shoulders, the forearms being flexed at right angles so that they lie parallel to the side of the head, the legs generally flexed slightly at the knees. This posture of the arms is quite usual, but the position of the legs shows greater variation. When both legs of the infant are actively engaged in kicking, it is observed that the movements are frequently, although not always, alternated. Thus when the right leg flexes, the left leg extends, when the right extends, the left leg flexes. The coordination may be best described as rhythmic stepping. Occasionally the legs are flexed together and extended together. Aside from sneezing, coughing, and general crying, only one characteristic vocal pattern was observed. This was called the "hunger cry" because it interrupts continuous crying during the hunger period. In subsequent investigations [Irwin and Curry (9), Irwin (7), Irwin and Chen (8)] this sound has been phonetically identified with sounds beginning with the glottal stop-plosive. The author now believes that it is no more characteristic of hunger than the general crying of which it is a part. Under the condition of the experimental cabinet this investigation revealed no highly integrated responses like fear, anger, or love (see 14, 18). With the exception of sucking, a flexible sleep posture, alternation of flexion and extension of legs, likewise variable, we have been unable to discriminate many nice (nonamorphous) coordinations in infants under 10 days when external conditions are kept constant.

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* The work of Gilmer (4) emphasizes this feature. *Cf.* Delman (3).

D. The behavior of the newborn is gradually speeded up as soon as feeding habits become well established. Usually it takes a day or more for the infant to become adjusted to breast or bottle feeding. Figure 2 indicates that activity on the first 2 or 3 days is quite low. On the third day there is a discernible increment in activity, and until the sixth day there is gradual and definite increase in the number of oscillations per minute.

E. There is an increase in dominance of anterior over posterior segments at the end of 10 *days.* An analysis of Table 5 will show that there is on the first day a slight dominance by the posterior segments. In contrast the average frequency of the anterior region on the last 2 days is 47 per cent of the total, while that of the posterior is only 22 per cent. This shift in behavioral dominance may be an expression of an underlying neural process in which the growing brain and the cortex assume control over the rest of the nervous system.

F. Vocal sounds at first are components of mass activity. It is an interesting fact that newborn infants utter very few noncrying sounds. An overwhelming part of its utterances are crying sounds. When the infant awakens before the feeding period and the time for it comes closer, the infant rolls the head, the mouth is opened in a wide rectangular manner, the body twists and jerks, bends, is thrown about, and the legs and arms kick and slash. Accompanying this mass activity there is much violent crying.*

G. The earliest beginnings of social behavior in the infant probably arise out of mass activity and crying. Although it cannot modify its physical surroundings, the infant, nevertheless, does modify its social environment. When mass activity and its crying component become extreme, this type of activity becomes a stimulus to other persons. This is true even of the experimenter, whose function as an investigator is to observe in a calm, scientific manner. Frequently the mass type of activity, especially during hunger, colic, or intestinal difficulties, leads him to drop the scientific attitude and attend to the relief of the infant. In the cases of a parent without scientific inhibitions this is true in greater degree. It is in this sense that crying and mass activity become a sign or signal to the attendant to do something for the infant. The beginnings of social behavior in infancy, then, must be sought in the stimulating effects of mass activity and crying.

H. Mass activity probably is the consequence of the neurological immaturity of the newborn. Minkowski (11) used an incisively descriptive term concerning early human fetal behavior, the term "pre-reflex." When he examined the spinal cord of young human fetuses he found that many of its elements are poorly developed. Some are in an advanced stage of maturity; others still are quite embryonic in their development. As the embryo grows, its nervous system also grows, but all parts do not grow equally. Some neurons lag behind others in ability to function. This means that in the spinal cord of the fetus a nervous impulse originating from a sense organ cannot transverse the nervous system uninterruptedly to a motor organ. Some neurones can carry the impulse but others cannot. Embryonic nerves are intercallated among mature ones so that an impulse does not get through directly and promptly. Rather, if it gets through at all, it radiates in a roundabout and delayed manner. This pre-reflex condition of the fetus accounts for the amorphous or massive nature of its behavior.

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* See Irwin and Chen (8) for the criteria of crying.

In the newborn the process of neural maturity is still incomplete, especially in the cortical areas of the central nervous system. Peiper (13) has indicated that the newborn is a thalamic organism, which means that the neural organs anterior to the thalamus, *viz.*, the cortex and corpus striatum, are not functionally mature. Since the projections from the cortex in the adult ramify to all parts of the nervous system, the newborn's behavior is not yet under the control of an organ which makes for exquisite precision of movement and for nicety of coordination of segmental behaviors into well-integrated patterns. It is this immaturity of the nervous system, particularly of the cortical portions, which probably underlies the massive nature of much newborn behavior.

I. Finally, this study has some bearing on the theory of development of behavior.* There are three general theories of the origin and development of behavior. One is held by Coghill (2) and may be designated as a theory of differentiation from an originally integrated pattern. The opposite view, the reflex theory, holds that behavior originates as a group of discrete units or reflexes which integrate into larger patterns. According to one view, development is a process of differentiation, while according to the other, it is a process of integration. A third view might be called the "eclectic" theory; it attempts to reconcile both the integrative and the differentiating explanations of development. Since these theoretical positions are based in part on animal and human fetal reactions we shall have to consider them as well as the human newborn materials.

The present study has indicated that *both specific and mass activities characterize the behavior of newborns.* It is, of course, not impossible that further research will determine how the newborn behavior relates to later fetal behavior, of which it is the postnatal projection. Moreover, while the evidence on the earliest forms of human fetal behavior still is an open question, it would appear that at the present time some eclectic view will best serve as a theoretical framework to explain the development of behavior. This is intended to mean that both differentiation and integration are processes characteristic of development.

Coghill described the first movement in the salamander as a side bending of the head which expanded until it included the whole organism. Limb movements first are an integral part of the total movement and only later are they separate movements independent of the trunk. A similar type of reaction with some variation has been seen in the embryos of the toadfish, the turtle, the rat, the cat, the pigeon, the hen, and the human. The variations in the behavior of these animals are not extreme enough to obscure the fundamental pattern.

Concerning the nature of enbryonic development in man, Hooker (5), who has done the most careful work in this field, has this to say:

> I am of the opinion that the development of activity in man follows the general plan laid down by Coghill: an expanding total pattern, co-ordinated from the beginning, from which specific patterns emerge. However, I wish emphatically to state that the sequence of behavior development in man is distinctly human and that it differs at least as much from other behavior sequences known to me, as they differ from one another. In comparison with that of the rat, the human sequence seems to be condensed so that activities follow one another rapidly in appearance (p. 69).

It looks as if an excellent case has been made for the Coghillian sequence during the fetal period. It would seem

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* The following represents the author's present position on the concept of development. It is a modification of his original view.

that the early career of the organism illustrates an orderly series of progressive changes, marked by more or less clearly defined but related stages to which we give the name of development. The behavior of the young organism presents the character of a generalized pattern which originated from a flexure which expanded to include the total organism. When this expansion is sufficiently advanced the general pattern tends gradually to break down into a group of specific reactions localized on small body segments and zones. During the generalized condition, a stimulus evokes a response in almost any segment and may set off the total pattern. During the stage of specificity, a stimulus will tend to induce a reaction only in the stimulated segment.

A somewhat different account of the first human behavior is given by Minkowski (12):

> Upon extraction the fetus makes more or less vigorous movements of the head, of the trunk, and of the extremities. The head turns from one side to the other, raises itself and lowers itself, the trunk bends and straightens out, the extremities lift or fall back again, flex or extend themselves, they stretch away from the trunk or draw to it or make movements of rotation. These reactions are *slow, asymmetrical, unrhythmic, inco-ordinated, diffuse and amorphous,* of small amplitude and with the tendency for the limbs to return to the original position. They are extended at a single articulation, for example at the shoulder, at the elbow, wrist, hip, knee; or at several articulations. They may be extended in a single limb or in several limbs simultaneously. Sometimes it is the proximal part of the extremities which is especially in play and sometimes the distal parts. In one case, a fetus of 8.5 centimeters, I observed some little separate movements of the fingers as well as a rapid trembling of the thumb. In another of 20 centimeters I also saw movements of the fingers. From time to time, especially when one is applying external stimulation, these slow and small movements are interrupted by more abrupt and rapid ones, which are more intense and of greater amplitude. This type becomes more frequent with older fetuses from four to five months, whose activities show at the same time an increasing tendency to assume, at least momentarily, a more regular character, the two arms or the two legs being moved in a manner more or less co-ordinated, simultaneous or alternating (p. 723).

This is the type of behavior to which Minkowski gives the name "pre-reflex." It does not reveal the primitive integrated total pattern reported by Hooker. Rather the behavior is of the amorphous type exhibiting also a degree of specificity.

It would be, thus, premature to claim that the Coghillian view of human behavioral development is finally established. On the contrary, the conventional and generally accepted theory of the process of development is quite different and the matter is still an open one. The conventional view holds that, instead of a general pattern from which specific reflexes and behavior emerges, the opposite occurs. At first there are single more or less isolated reflexes exhibited by various parts of the organism. All the complicated behaviors of later life are the result of a gathering together, an integration, of smaller units of behavior into these various patterns of behavior. This view has been held by physiologists for a good many years. It was first worked out on the basis of a century's research upon the reflexes of adult animals experimentally observed under highly controlled operative conditions.

The conventional view may be illustrated as follows. When you stop your car, you are integrating a number of separate movements. You are holding the wheel with one hand, changing gears with the other, pressing on the brake pedal with the right foot and throwing out the clutch with the left, watching the road in front and also in back through a mirror, smoking a cigarette, and perhaps talking to a friend sitting next to you. The theory maintains that the total pattern of behavior is a mosaic of a number of specific unit behaviors.

There is no use denying that many mature patterns are synthesized in this manner. The real question is whether this is the process characteristic of the early embryonic patterns. A number of very able investigators hold that the first movements are specific and not general. They have presented good evidence that the very first movements are not integrated patterns at all, but specific flexions or extensions of the forelimb, separate and independent of any control on the part of the trunk. The evidence at the present time must be accepted as good evidence. The obvious implication is that if a specific movement is the first fetal reaction not only is the patterned aspect of fetal behavior late in appearing but those patterns must be integrations of specific units. The fact that this has been observed by excellent investigators working on the early behavior of the rat, the cat, the hen, and the sheep makes it the more convincing. It seems to me that as long as this finding is valid there is reasonable doubt concerning the finality of Coghill's interpretation in spite of the large body of evidence presented by him and the group who have corroborated his view.

The two views outlined, however, do not exhaust the theoretical possibilities of formulating a concept of development. There is another approach which is eclectic in nature. It has been advanced by Barcroft, Barron, and Windle (1) as a result of their observations on the fetal behavior of sheep. Their evidence suggests that the first movements in the sheep embryo are not a total reaction pattern. Rather each response of head, fore-limb, hand, hind limb, and foot in its beginning possesses individuality. They find in the fetal materials which they used that each can be evoked as a separate movement before it becomes part of a patterned sequence. Its characteristics remain unaltered once it has become integrated, for very early they saw head and forelimbs moving together; then head, forelimb, and hand; then head, forelimb, hand, and hind limb. However, before each of these integrations was apparent, the newest element occurred as an isolated movement. These workers suggest that behavior has its genesis in local segments which are then gathered into a general pattern.

They indicate that the early active movements show several stages: the first, as indicated above, in which movements of different body parts are quite isolated; the second, in which two or three isolated movements are associated into a single pattern; and the third, in which such groups are further integrated into a general mass movement. In a letter written to me, Prof. Barcroft has indicated that

> . . . apparently meaningless reflexes can be induced and become integrated into a general mass movement. This mass movement once established then breaks up into "behavior patterns," *e.g.*, righting movements, respiratory movements, a movement which suggests sitting up, stabbing movements, and so forth. The general mass action is rather like a strychnine convulsion on a small scale. I think you can scarcely call a strychnine convulsion a "behavior pattern." There is not much behavior about it. A movement does not seem to merit the term "behavior" unless it is "about something" . . . jerks or twitches that you can produce by stimulation but which don't suggest any functional purpose I did not intend to include in "behavior." This is the most recent interpretation of embryonic behavioral development.

There are implications in this view which remain to be worked out, but it has the virtue that it may provide a basis for a reconciliation of the opposing Coghillian and conventional theories. It assumes the existence of a process of integration of isolated reflexes into a total pattern, which in turn differentiates into behavior patterns, which are characterized by the functions of adjusting the organism to environmental conditions which it later will face. There can be no doubt that both processes, integration and differentiation, are facts in development. The writer would add that, after the differentiation of the mass movement into behavior patterns has occurred and even while it is under way, these patterns are reintegrated into new patterns. What Barcroft has done has been to give an account of the origin of mass activity and also an account of its individuation, but the bewildering array of adult human habit action systems with all their flexibility and variations are not just simple differentiations. They are also new integrations. Both differentiation and integration mark the course of development.

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CHAPTER IV

THE DEVELOPMENT OF PREHENSION IN INFANTS*

H. M. Halverson

Introduction

The arm and hand of the neonate are not under cortical control, but they possess the capacity for orderly and cooperative functioning. At least seven distinct senses have their sense organs generously distributed in the muscles, tendons, and skin of this limb, particularly in the hand. The hand is thus a most important avenue for the infant's first impressions of the world about him. Moreover, it has greater potentiality for varied action than any other body region of equal volume. Its location at the end of the arm gives great range to its movement. The three joints of the arm, and the rotary action of radius upon ulna in the forearm, contribute to its freedom of operation. The length, strength, and flexibility of the five digits, with their 14 phalangeal segments, the prehensile value of thumb opposition, and the sensitivity of the finger tips, give the hand deftness in manipulation and exploitation and in adaptation of grasp to the characteristics of objects.

Prehension is a response to an object already located visually. There is convincing evidence (8) that, at the age at which the present study begins, vision is adequate for sighting the object. Hence, failure to make this response to an object placed within reach lies in the immaturity of the organism with respect to the accumulation of sensory cues, sensory coordination, and the ability to make appropriate postural adjustments.

The Experiment

Method, Subjects, and Procedure.—Earlier studies of prehension were biographical in nature (22, 23). Interest in this problem was reawakened as a result of the comprehensive research by Gesell (5, 6). The present study was undertaken in the photographic observatory (9) of the Yale Clinic of Child Development. The principal investigation was a motion and frame-by-frame analysis of cinema records of infant prehension of 1-in. red cubes. The subjects were 12 or more infants at each of the following ages: sixteen, twenty, twenty-four, twenty-eight, thirty-two, thirty-six, forty, and fifty-two weeks. They were selected from the group of infants whose records in the regular normative examinations showed that they were developing normally.

The procedure was as follows. The subject was brought into the photographic dome, relieved of all clothing, and given an opportunity to adjust to his surroundings before the cubes were presented. The subject was seated on the platform of the experimental crib (6), before, but not touching, the table top, which was supported elbow-high on the crib's adjustable side rails.

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* From a monograph by the writer (12). Adapted with permission of *Genetic Psychology Monographs.*

Infants who could not maintain a sitting equilibrium were placed in a small Morris chair with a supporting belt about the waist. This arrangement was elastic enough not to interfere with forward and lateral movements of the trunk. The subject faced the longer edge of the table top (30 by 20 in.), the gray surface of which was divided laterally into six equal lanes by lines which extended from its far edge to a horizontal line parallel with, and 6 in. from, the near edge. These lines aided materially in the analysis of the records.

Each experiment occupied 20 sec. The examiner (*E*) stood on the left side of the crib, took a cube in her left hand, and carried it to the remote edge of the table top. She then tapped the cube against the edge of the table to draw the infant's regard to this point. Now, she advanced the cube along the median line at a speed which brought it to the standard median position, a point 6.5 in. from the near edge, in 2 sec. *E* then released the cube with one of its surfaces fronting the infant. If, after 9 sec., the infant appeared still unlikely to touch it, *E*, at a signal, advanced the cube to the near median position, 3 in. nearer the infant. Thus, a subject who did not acquire the cube within the first 10 sec. was given a second chance to prehend it at a point easily within reach. This procedure was repeated with a second and a third cube.

A motion-picture camera, encased in a nearly soundproof box and situated at an angle of 50 deg. above the table top in the front median plane, recorded the subject's activity. A second camera at the right of the subject, at ear level, was used judiciously to provide profile records. Both cameras were carefully timed for a speed of 16 exposures per sec. (10).

This experiment was later repeated with various other objects as well as the cube (*cf.* pp. 62–64).

Method of Studying Records.--A specially constructed projection table (11) was used in studying the film record. The projector was equipped with a 1-in. lens and was adapted for operation by hand crank as well as by electric power and for film movement backward as well as forward. It was mounted beneath the table in such a manner that, with the aid of a mirror, it projected a 2.5- by 3-in. image of the film upward on the ground-glass plate set in the corner of the tilted table top. The crank could be operated at speeds varying from "stills" to 32 exposures per sec.

Each movement of the subject could be timed and traced, so that eventually the behavior appeared as a temporal-spatial pattern. For example, in plotting the route of the infant's hand in reaching, we "stilled" the successive frames in the approach, and, with the tip of the forefinger as the reference point, charted each step in the progress of the hand on a reproduction of the ruled table top drawn to scale. From the total number of frames involved, we determined the duration of the reaching act. In addition to timing and plotting the behavior, we noted in detail other items having to do with the mechanics of reaching, grasping, and manipulation, in order that the genetic aspects of prehension might be brought even more clearly into relief.

Results

In the analysis of the films, the nature and duration of the subject's visual regard were studied in detail, and these data have been quantified (12). The results indicate that the infant's regard for the object presented in this experimental situation is at all times adequate to elicit some definite response, even as early as sixteen weeks. For this reason, the data presented here are restricted to those of prehension itself.

We have selected for detailed discussion those aspects of reaching and grasping which are of most consequence genetically.*

Reaching.—With the exception of the youngest (sixteen weeks) group, all the subjects made immediate attempts to grasp the cube in the standard position. However, few infants actually secured it until they were twenty-eight weeks of age. At the near position, success came somewhat earlier. Overreaching and underreaching occurred frequently at twenty to thirty-two weeks. Raising and lowering the fingers, raising the hand, scratching the table top, or rubbing it with the heel of the hand, while regarding the cube, were common at sixteen to twenty-four weeks. These forms of activity may occur at the end of an unsuccessful reach, or they may be the only response to the cube. These responses carry significance as incipient approaches.

Form of the Approach.—By an "approach" is meant any movement of the arm directed at the cube during regard for it. It does not necessarily imply contact or grasp. The term "closure" applies to the act of flexing the hand upon the cube.

There are three recognizable forms of approach: (*a*) the *sweeping* approach, in which the hand sweeps outward, or inward, or both, without getting appreciably nearer to the cube; (*b*) the *circuitous* approach, in which the hand moves outward laterally during the first part of the movement and inward toward the mid-line of the table during the latter part, thus describing an arc; and (*c*) the *straight* approach, the customary form for the older infants. The frequency with which each form occurs at the various age levels is indicated in Table 1.†

Of the three forms, the circuitous is the most common. Table 1 shows that it is the prevailing form of approach for subjects under thirty-six weeks of age, and only gives way to the straight approach near the end of the first year. The sweeping approach is used chiefly by infants under twenty-eight weeks of age. Many of the circuitous approaches of the younger subjects were composed of sweeping movements and might just as well have been classified as sweeping approaches. However, according to the criterion employed, a sweeping approach becomes circuitous if it results in diminishing the distance to the cube. Hence, among the circuitous approaches are many in which the movements are sweeping in nature, although the total response must be classified as circuitous. Fig. 1*B* is a close approximation of this form of approach.

TABLE 1.—FREQUENCY OF EACH FORM OF APPROACH AT EACH AGE LEVEL

Form of approach	Age, weeks							
	16	20	24	28	32	36	40	52
Sweeping	3	3	3	1	0	1	0	0
Circuitous	11	27	22	18	22	12	10	7
Straight	1	5	3	8	2	15	15	19

Fig. 1*A* shows the route of the forefinger of a twenty-weeks infant in reaching for the cube. The hand first sweeps out laterally from the mid-line of the table and then back to the point from which it started, but gets no closer to the cube. Since the chief source of the movement is the shoulder joint, the action of which is largely abduction

and adduction, the movements of the hand will be principally in the two lateral directions. These lateral movements have genetic significance in view of the fact that, as shoulder and elbow extensor movements come into play, the hand on attaining the most remote point in the outward lateral sweep moves forward before returning toward the mid-line (*cf.* Fig. 1, *A* and *B*). Thus, the sweeping approach becomes very circuitous. The latter form of approach is a typical corraling movement by which the infant draws the cube toward him before grasping it. As shoulder and elbow extensor movements increase in magnitude, the infant begins to lean forward and rotate the trunk in support of the reaching movement. These combined actions have the effect of projecting the hand forward and thus extending the reach in this direction. In this way the approach becomes less circuitous and eventually straightens into the direct approach (*cf.* Fig. 1, *C* and *D*).

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* For a quantitative summary of the frequency of reaching and grasping responses to the cube in the standard and near position, and for a quantitative analysis of the temporal and spatial aspects of the approach, the reader should consult Halverson, 1931 (12). Space does not permit the reproduction of all these data in the present paper.

† The approach has also been classified according to whether one or both hands are employed (12). Reaching is at first largely bilateral but later gives way to the more adaptive unilateral type.

The modification from sweeping approach to straight approach is seen in the decreasing amount of *hand digression.* This measure was obtained by drawing a straight line from the cube to the position of the forefingertip at the start of the approach and measuring the extent of the greatest lateral deviation from this line.* The amount of digression decreased gradually from about 3 in. at sixteen weeks to 1 in. at forty weeks.

The Profile of the Approach.—Lateral views of the reaching reactions also disclose three principal types of approach: *sliding, looping,* and *planing.* In the first type, the infant slides the hand along the table top. In the loop type, the hand rises high, moves forward or laterally, and descends sharply, the path taking the form of an arch. In the third type, the pronated hand planes out toward the cube on a broad, low arc.

TABLE 2.—FREQUENCY OF EACH APPROACH PROFILE AT EACH AGE LEVEL

Profile types	Age, weeks							
	16	20	24	28	32	36	40	52
Slide	9	13	15	12	11	1	3	0
Loop	14	19	9	9	8	6	1	0
Loop-slide	0	3	8	9	3	0	0	0
Planing	0	1	4	9	10	28	32	34

Table 2 shows the frequency of occurrence of the loop, slide, and planing approaches for the eight age groups. The speed of development in reaching is indicated by the fact that all infants use the adult (planing) type of approach at fifty-two weeks. The loop and the slide usually occur in conjunction with the sweeping and circuitous forms of approach and the planing type with the direct approach (*cf.* Tables 1 and 2). Combinations of these types are also exhibited. For example, a loop approach which falls short of its mark may be followed by a slide or another loop. The loop-slide combination occurs frequently at twenty-four and twenty-eight weeks.

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* In another study (14), a method was devised for the determination of the directness of approach as a measure of skill in reaching. This measure was taken to be the *ratio of hand advance to hand deviation.* By hand advance is meant the difference between the distance from the forefinger to the object at the start of the reaching movement and the distance at the end of the reaching movement. By hand deviation is meant the amount of lateral digression of the hand during reaching. With very young infants there were several instances in which the hand was farther away from the cube at the end than at the start of the response; hence, the ratio had a negative value. In general, the ratio was found to increase as a function of age, from a negative value (−0.67) at twelve weeks to a high positive value (11.93) at sixty weeks. This signifies increasing skill in reaching, as indicated in the relative directness of the reaching movements. It is interesting to note that digressions toward the median plane of the body are eliminated earlier than are the lateral digressions. The early elimination of this type of error is absolutely essential to accurate reaching, since medial digression of the hand obscures vision of the object.

In the early approaches, raising the hand, projecting it, and lowering it sometimes appear very much as discrete acts. By forty weeks these are resolved into a single fluent reaching movement. The younger infant raises the hand, then directs its course, and places it pawlike on the cube. The older infant economically combines these acts and during the approach is already setting his fingers for the grasp (*cf.* reduction in closure time, Table 4).

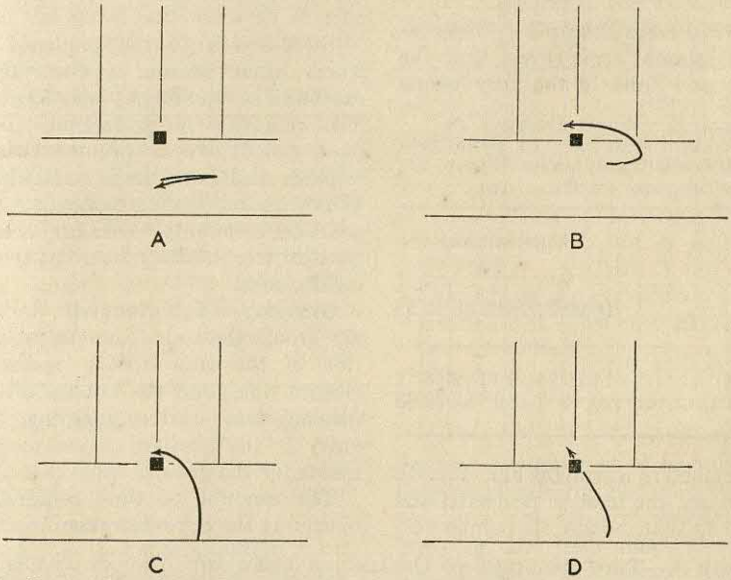

FIG. 1.—Route of forefinger in approach: *A*, at 20 weeks; *B*, at 28 weeks; *C*, at 36 weeks; *D* at 52 weeks.

Film records obtained with the side camera provided data on forward trunk and head displacement and on elbow extension (12). Subjects did not, as a rule, lean forward to reach until they were twenty-four weeks old. At thirty-two weeks the trunk begins to play an adaptive role in reaching, and the amount of leaning is a function of the remoteness of the object to be prehended. The head is held more and more erect as reaching improves, and at fifty-two weeks it is virtually in line with the trunk. There is little extension of the elbow in reaching at sixteen and twenty weeks. At twenty-four weeks, extension is much greater, and at twenty-eight weeks, it is maximal for these experimental conditions.

In another study (14), the reaching response has been analyzed into the movements of trunk, shoulder, elbow, wrist, and digits, for the purpose of determining their relative participation in reaching, as a function of age. These parts were rated in usefulness for reaching on a scale of 1 to 3. The plotted data suggest the following general conclusions. The shoulder dominates all other parts up to about thirty-six or forty weeks of age, and continues in a role of major importance throughout the first sixty weeks. The elbow and the digits at first contribute much less than the shoulder, but their participation increases rapidly. The elbow continues to increase in importance throughout the 60-week period, while the digits reach a maximum somewhat earlier. The trunk and wrist contribute little until about twenty-eight weeks, and from twenty-eight to forty weeks both advance rapidly. At first, the trunk aids in reaching by leaning forward; later, by twisting so that one shoulder is rotated ahead of the other. By fifty-two weeks, the trunk contributes its full share. At forty weeks, wrist participation is practically maximal, closely paralleling the digital curve.

Wrist Posture in Reaching.—Observations of infants' arms reveal that the forearm and hand of the very young infant extend in a straight line (Fig. 3). In reaching, the hand is projected and lowered so that most of its palmar surface contacts the cube. Volar flexion (see Fig. 4) predominates. During the second half of the first year, a significant change occurs in the posture of the wrist. The wrist begins to assume an ulnar flexion (see Fig. 4), so that the straight line through elbow and wrist no longer extends through the middle finger, but passes instead between the forefinger and thumb (Fig. 3). This change in wrist posture, which occurs concurrently with the development of thumb opposition, brings the thumb and forefinger foremost to the most favorable position to bear upon the cube.

TABLE 3.—WRIST POSTURE IN REACHING: FREQUENCY OF STRAIGHT AND OF ULNAR-FLEXED WRIST POSTURES AT EACH AGE

	Age, weeks							
	16	20	24	28	32	36	40	52
Straight	14	19	14	9	3	2	3	1
Ulnar flexion	0	4	7	18	18	32	33	33

TABLE 4.—TIME REQUIRED TO OBTAIN THE CUBE AND AMOUNT OF CUBE DISPLACEMENT DURING GRASPING

The median is employed as the measure of central tendency.
S.D. = standard deviation

	Age, weeks													
	20		24		28		32		36		40		52	
	Med.	S.D.	Med.	S.D.	Med.	S.D.	Med.	S.D.	Med.	S.D.	Med.	S.D.	Med.	S.D.
Time up to grasp, sec.	16.5	1.2	11.0	4.7	6.3	5.4	3.0	5.0	4.0	3.3	3.0	4.3	3.3	4.2
Closure time, sec.	1.5	0.9	0.9	1.4	1.3	1.4	0.6	0.6	0.7	0.2	0.5	0.7	0.3	0.4
Amount of cube displacement, in.	3.0	1.8	2.5	1.1	1.8	3.1	1.0	1.4	1.0	0.7	0.5	1.3	0.5	1.1
No. of grasps	6		16		26		24		30		26		29	

Table 3 indicates the frequency with which ulnar flexion of the wrist is exhibited in reaching at each age level. The majority of approaches before twenty-eight weeks occurs with the forearm and hand in a straight line. Ulnar flexion makes a desultory appearance at twenty weeks and assumes a major role in arm posture at twenty-eight weeks.

Grasping.—Table 4 gives, for each age group, the time from the presentation of the cube to its prehension, closure time, and the amount of cube displacement during grasping. Each entry is the median of the measurements for the group.

The amount of time required for obtaining the cube decreased from 16.5 sec. at twenty weeks to a minimum of 3 sec. at thirty-two weeks. The time required to establish a hold on the cube after contacting it (closure) decreased from 1.5 sec. (24 frames) for the twenty-weeks group to less than 0.5 sec. (5.5 frames) for the fifty-two-weeks group. This fact is associated with increasing precision in the placement of the fingers. The distance that the cube was displaced during grasping was reduced from 3 in. at twenty weeks to 0.5 in. at forty weeks. The data indicate, on the whole, a rapid rate of improvement during the first year of life in the speed and accuracy of prehension. Large individual differences are apparent.

Stages in the Development of Grasping. The "stilling" process of studying the motion film reveals eight types of grasp (12), which occur in genetic sequence consistent with the growth of the infant. For the present purpose, however, these types may be conveniently grouped into three stages, which constitute the most significant steps in the development of grasping. These are: *simple palmar grasping, palmar grasping with thumb opposition,* and *finger-tip grasping.* In the first type, the fingers close on the cube and press it strongly against the heel of the palm, with the thumb in line with the fingers. The hand almost completely envelops the cube, so that manipulation is very limited. This is essentially a "holding" grasp. In the next stage, the cube is shifted toward the radial side of the hand and the thumb begins to participate actively in grasping. This is the start of thumb opposition. In the final stage, thumb opposition is fully developed, and this permits the infant to balance the object between the tips of the fingers and thumb. The surfaces of the cube are now largely exposed and available for exploitation and manipulation.

Table 5 indicates the frequency with which each stage is found in each age group. Simple palmar grasping was the most frequent type with infants up to twenty-four weeks. At twenty-eight and thirty-two weeks, palmar grasping with thumb opposition predominated. There was no evidence of finger-tip grasping until thirty-two weeks, but from thirty-six weeks on this was the most common type, and by fifty-two weeks virtually all subjects employed the finger-tip grasp.

TABLE 5.—FREQUENCY OF OCCURRENCE OF EACH STAGE IN THE DEVELOPMENT OF GRASPING AT EACH AGE LEVEL

	Age, weeks							
	16	20	24	28	32	36	40	52
Simple palmar grasping	0	5	9	7	3	3	1	2
Palmar grasping with thumb opposition	0	1	7	19	17	7	5	1
Finger-tip grasping	0	0	0	0	4	20	20	26

In Fig. 2, cube, is represented the gradual development of grasping as it evolves genetically. Sketches 20 and 24 illustrate two types of simple palmar grasping, the first ulnar, the second medial. Sketch 32 illustrates the palmar grasp with thumb opposition. Sketches 36, 48, and 56 are illustrations of finger-tip grasping, in which progress is in the distal direction. One should observe the large amount of cube surface exposed at fifty-six weeks.

Manipulation and Exploitation.—Infants of all ages exhibit a wide variety of activity in the cube situation.* Some of the more genetically significant reactions, relating to manipulation and exploitation of the cube after its prehension, are listed in Table 6. In interpreting the data, it is well to remember that each situation lasted only 20 sec.

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* For a detailed account of the infant's total behavior under similar circumstances the reader should consult Gesell and Thompson, Infant behavior (8).

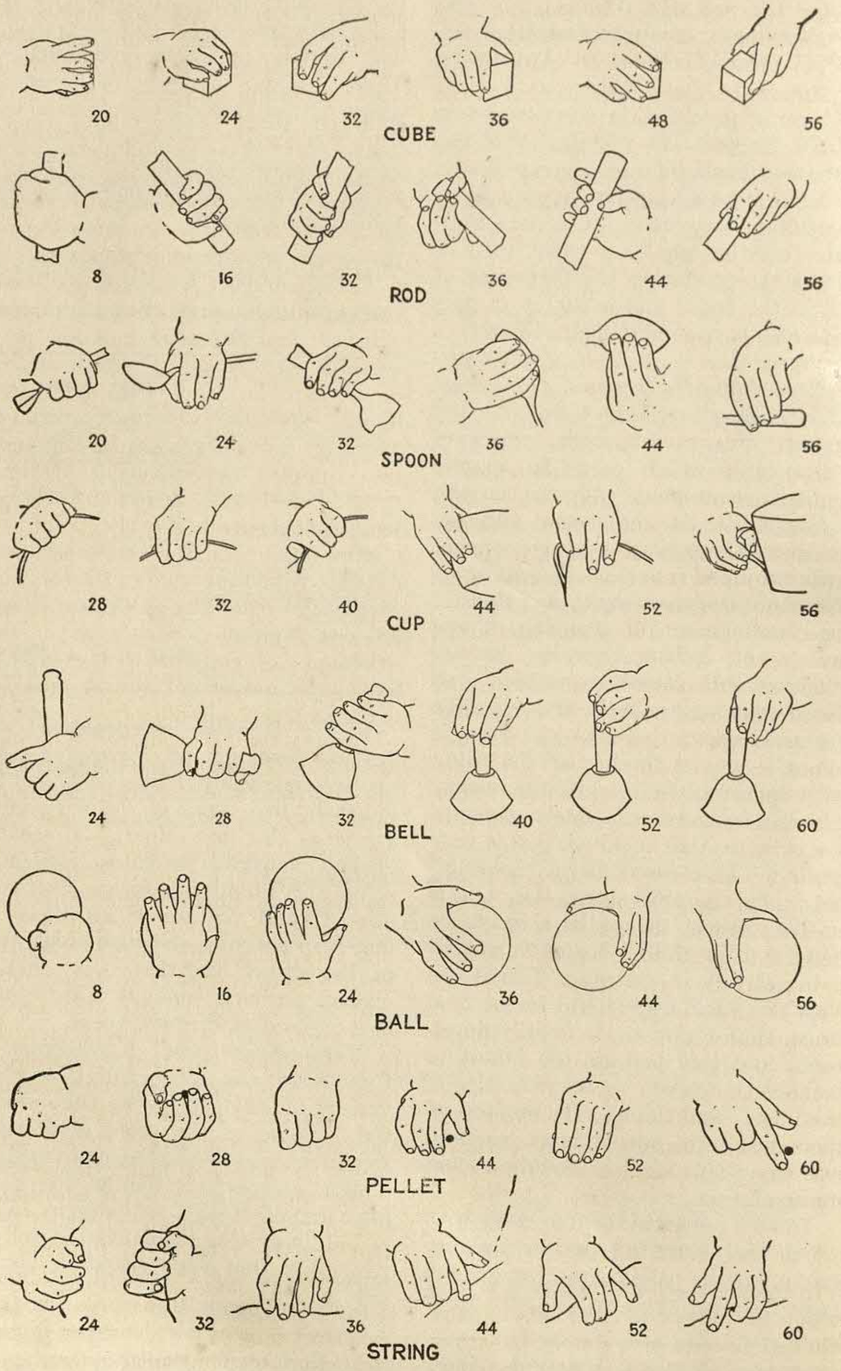

FIG. 2.—Series of grasps in developmental sequence for each of eight objects: cube, rod, spoon, cup, bell, ball, pellet and string. The number below each drawing indicates the age, in weeks, at which the grasp characteristically occurs.

TABLE 6.—FREQUENCY OF OCCURRENCE OF MANIPULATORY AND EXPLOITATIVE ACTIVITIES INDICATIVE OF ADAPTIVE PREHENSION

	Age, weeks							
	16	20	24	28	32	36	40	52
Inspects cube	0	0	3	9	5	11	9	8
Fingers cube	0	0	0	0	1	3	5	3
Bangs table	0	1	3	6	3	7	8	9
Releases cube voluntarily	0	0	0	4	5	4	5	14
Transfers to other hand	0	0	1	3	4	10	9	8

Inspection of the cube, banging it against the table top, and transferring it from hand to hand occur with increasing frequency. Releasing it voluntarily begins at twenty-eight weeks and is common at fifty-two weeks. Fingering a prehended cube begins at thirty-two weeks.

The results suggest that increase in the number and variety of manipulative and exploitative activities accompanies improvement in the technique of prehension. Active manipulation really begins at twenty-eight weeks and is associated with radial prehension (grasping mainly by thumb, forefinger, and middle finger) and rotation of the forearm, which brings the cube into view for inspection. The viselike grip is giving way slowly to adaptive holding. With the advent of digital prehension (grasping by the fingers), the infant begins to adjust the pressure of his grip to the weight of the cube. This accomplishment marks a signal advance in manual skill, especially in connection with fine manipulation and release of objects.

Discussion

In the acquisition of motor skill, the infant, in contrast to older children and adults, has no reserve supply of learned movements upon which he may draw. His repertory of movements at birth consists of a relatively large number of reflexes and a few more extensive behavior patterns which are concerned with simple life processes. There is no evidence that the cerebral cortex exerts any specific influence upon behavior until several weeks after birth (4), when new behavior patterns are formed through the modification of these early sensorimotor responses.

The shoulder, with its ball-and-socket joint, equipped with a system of extrinsic and intrinsic muscles, is a versatile mechanism. The arm at this point can be abducted, adducted, flexed, extended, and partly rotated, and these movements can be combined into complex movements of various types. The elbow is essentially a hinge joint, but near it are the points of origin of the pronator and supernator muscles, which function in the rotation of the forearm. The action of these muscles, combined with that of the wrist muscles, imparts to the wrist a freedom of movement almost equal to that of a true ball-and-socket joint.

By means of a complicated system of muscles in the hand, the digits can be flexed, extended, abducted, and adducted. Of special interest are the thumb and forefinger. In reflex grasping, while the three ulnar digits (middle, ring, and little fingers) function consistently as a unit, the thumb and forefinger frequently do not actively participate in closure (15). Thus, these two digits very early give evidence of their specialized role in prehension. It has been shown (13) that the arrangement of the tendons to the digits is such as to favor the independent action of the forefinger and of the thumb with respect to the other digits. In the case of the thumb, there is an additional muscle group, by means of which this digit can be rotated to function in opposition to any one or any combination of the fingers. In accordance with the proximodistal law, however, digital prehension by thumb and forefinger, including thumb opposition, does not function effectively until the second half of the first year of life. This delay may be due also to the complicated nature of the activity.

Reaching.—Normally, the first reaching movements, which occur in the supine position, are executed by the trunk and by the head and neck (6, 23). As early as eight to twelve weeks, the infant, still supine, exhibits small incipient arm movements in response to a rattle. Visually directed movements, definitely oriented toward an object, occur somewhere between fourteen and twenty weeks (3, 8). At twenty weeks, approach movements toward a rattle held 4 in. above an infant's chest frequently result in contact and at twenty-four weeks in grasping. Up to twenty-eight weeks, reaching is usually bilateral, thereafter becoming progressively unilateral.

About 50 per cent of infants at sixteen weeks have the ability to hold the head erect, while practically all twenty-four-week infants have this ability. At about twenty-eight weeks, the child begins to maintain sitting balance, with trunk erect, for brief periods. By thirty-six weeks, this posture can be maintained for an indefinite period. Moreover, the child can then lean forward in reaching and readily regain the erect position. From this time on, there is a rapid gain in the ability to perform new activities in the sitting position.

The function of the trunk in reaching is in bending forward and twisting so that one shoulder is rotated ahead of the other. These movements shorten the distance to the cube. Active cooperation by the trunk for this purpose begins at thirty-two weeks and develops rapidly for the next 8 weeks. At fifty-two weeks, the trunk contributes its full share to the reaching activity.

Shoulder activity dominates the first voluntary reaching movements. This activity is at first confined largely to abduction and adduction, and this accounts for the sweeping and circuitous approaches (*cf.* page 42). Gradually, these movements are supplemented by movements of forward flexion, until at one year the influence of the former upon reaching is practically negligible, and the approach approximates a straight line.

Elbow extension, under the conditions of our experiment, is at first limited. Shoulder movements often carry the arm about with little elbow activity. Full extension of the elbow, when it does occur later, is so poorly timed with the movements of the shoulder and trunk that for many weeks there are large errors in reaching. The infant is almost one year old before the elbow contributes as much to the success of reaching as does the shoulder, although several instances of superior cooperation by this joint appear at thirty-six and forty weeks.

Although the fingers begin to function in reaching at twenty weeks, by opening, closing, and scratching movements, extension, which anticipates radial grasping, does not begin until twenty-eight weeks, but it improves rapidly. Pointing by the forefinger is incorporated into the reaching activity during this period. Final adjustments by the digits at the end of the reaching movement, which involve careful placement of the forefinger and thumb, are difficult, and the period from forty to fifty-two weeks shows slow progress in this fine prehensory maneuver.

It is not until digital prehension appears that the wrist takes an active part in reaching. Before this time, reaching is mostly of the pawing type and wrist activity is unimportant, but from thirty-two to forty weeks the effectiveness of the wrist increases rapidly. The principal role of the wrist is ulnar flexion, which brings the distal volar pads of the forefinger and thumb (pads of the finger tips) forward toward the cube, and favors contraposture (opposition) of these digits in grasping. In addition, ulnar flexion swings the digits out of the direct line of vision, so that the cube is visible during the entire approach. The wrist also aids by extension and flexion, by which the hand is elevated or lowered adaptively.

The functional relationship of arm and hand reverses with age. In early infancy, it is the arm which determines the position of the hand and the direction of its movement, and the hand for the most part moves passively and with no more specialized function than if it were simply a distal extension of the forearm. Later, as the forefinger and thumb assume specialized functions, the hand actively directs the course of the associated arm movements.

We do not view as random any approach movements of the arms and hands during the infant's regard for the cube. The sight of the cube seldom fails to elicit increased arm and hand activity, and this activity is apparently directed toward the securing of the cube. The movements, while they may be poorly directed, are not aimless. The infant advances upon the cube by the only route which he can follow by virtue of the stage of development of his neuromuscular system, and this route is, for him, the most direct approach, be it zigzag, curved, or straight.

The three forms of approach (*cf.* page 42) follow in genetic sequence and are intimately related. Even the early sweeping movements appear to be the infant's approximation toward the straight-line approach of the one-year subject. The lateral sweeping movements of the first stage are initiated by the abductive and adductive movements of the shoulder. The circuitous movements represent an intermediate stage in the development of reaching. To the movements of the shoulder are now added extensor movements of the elbow, which tend to advance the hand and thus to cause the approach to be circuitous. These extensor movements become progressively more significant in determining the direction of the approach, until eventually a stage is reached when the approach approximates a straight line.

It must be understood that the infant does not progress smoothly from one stage to another. As he enters upon the second stage, the approach is at first extremely circuitous, before the movements become resolved into a smooth arc. Similarly, as he passes from the second stage to the third, the approach is at first sinuous and wavering, with many lateral deviations, before it evolves into the short, direct approach.

Sensory coordination plays a significant role in reaching. The infant must make appropriate responses to visual cues and to kinesthetic cues associated with body equilibrium as well as with reaching itself. Awareness of movement in parts of the body comes through impressions from the kinesthetic sense organs located in the tissues of the moving parts. In the acquisition of a motor skill, such as reaching, modifications of the component movements are accompanied by corresponding modifications of the impressions from the kinesthetic end organs, and the experience so gained leads ultimately to perfection of the act. By fifty-two weeks, this kinesthetic pattern is so well established that the infant, once having located the cube visually, can skillfully perform the act of reaching without further regard for the cube.

Grasping.—Grasping responses of a reflex nature occur long before birth (1). The most systematic study of human fetal grasping is that of Hooker (18), whose data indicate that the early grasping response is a two-phase activity consisting of (*a*) finger closure and (*b*) gripping (clinging). Closure occurs in response to light pressure stimulation of the palm, while gripping is a "static" proprioceptive reaction to a pull against the finger tendons.

The grasping reflex of early infancy (15) suggests that the sensory and effector nervous mechanisms, which function in bringing into action the musculature of the ulnar hand (side of hand on which little finger is located), respond adequately under control of a lower center in the central nervous system and that kinesthetic cues are not yet functional in voluntary adjustments of hand or digits. The relative inactivity of index finger and thumb in reflex grasping suggests that they are subject principally to control by the cerebral cortex as highly specialized manipulatory organs. As has been pointed out (page 46), the special division and arrangement of the musculature of the hand lend support to this view.

Voluntary grasping depends upon the infant's capacity to perceive relationships in visual space and to coordinate the movements of trunk, arm, and hand in reaching for and grasping the visually perceived object. The proper functioning of the hand requires central correlation of exteroceptive impulses from the eye and kinesthetic impulses from the muscles, tendons, and joints as they undergo changes in extension, flexion, or tension, so that appropriate adjustments of the moving parts may occur smoothly. Precise digital grasping takes place only when the individual digital pressures are so distributed that they oppose each other in delicate balance.

Roughly, there are three stages in the development of grasping. The first is the *palming* stage, which characterizes the first twenty-four weeks of life. All objects are forced into the palm, mainly by the three ulnar digits. In the third stage, which begins definitely at thirty-six weeks, *digital grasping* supercedes palming. Between these two stages is an intermediate stage. This is the period of adjustment and refinement of crude, whole-hand gripping into adaptive digital prehension. Many errors in grasping occur during this period because of failure in precise placement on one or more digits upon the cube. Hence, many grasps which begin favorably become inferior before completion.

Two other developments accompany the change from palmar to digital grasping. (*a*) The infant during the first half year closes his hand upon the cube with a force much greater than that required for holding it. By the end of the first year, however, he holds it in his fingers and with just sufficient pressure to insure against loss of the cube. (*b*) Digital flexion undergoes a gradual transformation. In early infancy, all joints of the fingers flex sharply to encircle the cube. As grasping improves, the digits flex less at the phalangeal joints, and at fifty-two weeks most of the flexion occurs at the metacarpal phalangeal joints, a type of flexion which brings the tips of the fingers squarely in opposition to the distal pad of the thumb (Fig. 2, cube).

The thumb has attained its rotation toward the adult position morphologically at the eleventh week of fetal life (18), but it is incapable of effective functional opposition until the second half year after birth (*cf.* Fig. 2, cube, 32). Our investigation shows that thumb opposition takes definite form at twenty-eight to thirty-two weeks (page 46), although some attempts to grasp oppositionally are made at an earlier age. These results are in fairly close agreement with those of Jones (21). An intensive study of thumb opposition (7) reveals the stages by which the child acquires this ability. These stages range from simple adductive movements to true volar opposition (where one part of palmar surface opposes another part).

The Relation of Cutaneous and Kinesthetic Cues to Grasping.—We have noted the increased use of the thumb and forefinger in prehension during the second half of the first year of life. Why is it that the index finger, usually considered the most sensitive to cutaneous stimulation, is so little utilized in early infancy, while later it assumes the primary role in all forms of prehension?

Why is it that the infant now uses his forefinger to point, poke, push, rub, and roll objects on the table top or in the hand (see also 8). Why does he repeatedly transfer objects from hand to hand with the finger tips, put them down and pick them up again, and inspect them? Is it merely exploitation, or is it the beginning of an appreciation of objects through sense perception?

The questions can best be answered, probably, in terms of two facts in development. (*a*) Tactual sensibility is probably low for some time after birth; and (*b*) the kinesthetic cues, which make for synergetic action in the musculature of the hand, are lacking during the first half year. Neurological evidence (4, 16, 17, 24) indicates that in early infancy the peripheral nerves in the arm, as well as the higher centers, are in an immature stage of development. Among the nerves examined (24) were the ulnar, radial, and median, the three nerves which contribute to cutaneous, muscular, and articular sensibility in the forearm and hand. In view of these facts, it is not to be expected that delicate maneuvering by the forefinger, and such a complex act as thumb opposition, will appear before the second half year of life.

This interpretation of the relatively late development of fine digital control is further confirmed in the development of voluntary release. It has been pointed out (page 45) that in early voluntary grasping the young infant grips the object with unnecessary force, while the older infant holds it adaptively with the finger tips. The nature of the early grasp is an indication that the grasping reflex in its "static" proprioceptive phase (15) is still operative. The "static" proprioceptive reaction, in this context, is a response to a steady pull against the flexor tendons of the fingers. As long as the pull is continued, the reaction will continue. Since it is the presence of the cube in the hand which evokes the "static" response, the response continues as long as the cube is present; hence, the cube cannot voluntarily be released. Release can occur at this stage, however, if the object held in the hand be brought into contact with a resisting surface, in which case the resistance offered by the surface has the effect of relieving the pull on the tendons. From thirty-two to forty weeks, the resisting surface is either the other hand, as in transfer, or the table top. As kinesthetic cues are made increasingly available for use in prehensory activities, the "static" response gives way to light, manipulatory holding, in which the forefinger and thumb play the major roles. By fifty-two weeks, the infant succeeds in dropping the object voluntarily and without external resistance. The improvement in release during the last part of the second half year of life is seen in the increasing number of activities of which this response is a part (*cf.* Table 6). The release pattern continues to improve throughout childhood.

Appreciation of Size, Form, and Weight.—Infants of less than twenty-four weeks do not adapt their grasp to the physical differences between objects; instead, they hold all objects in a persistent, viselike grip. Either they cannot adjust the force of this grip, or they fail in adequate perception of the size, mass, form, and surface characteristics of the object. This type of grasping is in sharp contrast to that of infants of fifty-two weeks, whose precise placement of the digits and economy in gripping force indicate an appreciation of the physical qualities of objects.

Adaptation to size, form, etc., as seen in the disposition of the digits during the approach, appears at about thirty-two weeks. Infants up to six months of age reach with the pronated hand, the thumb extending passively in line with the fingers. The fingers usually remain extended until the palm contacts the object, and the thumb remains inactive even in grasping. The object sometimes slips from the hand because of misjudgments of direction or distance. Readjustment of the hand for improvement of an inferior grasp never follows poor hand placement, because the infant cannot voluntarily relax his grip. Infants of forty to fifty-two weeks of age, in reaching, gradually align the forearm and radial digits with the object and adjust the digits to its size and form. For large objects, *e.g.*, a ball, they maintain a wide gap between the thumb and the other digits. For small objects, *e.g.*, a pellet, they close the thumb-forefinger gap so that only slight additional flexion of these digits is required for closure.

Advantages of Digital Grasping.—During the first year of life, when reaching is changing from the widely circuitous type to the straight type, the grasp itself undergoes a transformation, which constitutes the greatest single advance in the individual's prehensory development. In this period, the grasp is changed in type from a crude, tenacious, palmar grip to a light, balanced, digital grip. The year-old infant exhibits the straight approach in reaching, a finger-tip grip in grasping, and nicely balanced digital placement in holding. Discounting the advantages of added length and strength of the digits and increased knowledge and practice, there is little additional progress revealed in the grasp of the three-year-old, or even in that of the adult (*cf.*, *e.g.*, Fig. 3).

During the first year of life, the grasp changes from a *holding* grip to a *feeling* grip. The progressive movement of the object in the hand from ulnar palm to radial digit tips is associated most probably with a progressive facilitation of perceptual and manipulatory functions. Digital grasping, which involves less cutaneous contact with the object than does palmar grasping, permits greater freedom of the digits in moving the object. Thus, transfer, release, throwing, and exploratory activities, which require frequent readjustments by the thumb and fingers, are greatly facilitated.

Grasping by digit tips has two other advantages over palmar gripping. For precise digital grasping, the entire musculature of the hand must be under fine control, which requires well-developed functioning of the kinesthetic mechanism for the hand and digits. This full play of the proprioceptors enhances delicacy of pressure, preciseness of finger placement, and dexterity in manipulation, at the same time aiding in the perception of the size, form, and mass of objects. Furthermore, digital grasping brings objects into direct contact with those portions of the volar hand which are most sensitive in the perception of the surface qualities of objects.

Prehension of Other Objects.—The general course of prehensory development is seen again in a series of experiments (13) in which the following objects were employed in place of the cube: rubber ball, rod, teaspoon, cup, hand bell, pellet, and piece of string. These objects were selected because the variety in their size, form, and weight was sufficient to elicit practically all the various grasping responses of which infants of sixty weeks and less are capable. The experiments differed in no essential way from those with the cube, in respect of subjects, procedure, and manner of recording and analyzing data. With the youngest subjects (eight to sixteen weeks), however, it was necessary to place the object against the palm in order to elicit grasping responses.

The results of these experiments are represented graphically in Fig. 2. For each object studied, one may examine, reading horizontally, the modification of the grasping response in developmental sequence. The numbers below the drawings indicate the age, in weeks, at which each grasp was found characteristically to occur.

It will be seen that, for each object, the development proceeds from a crude, pawlike type of closure to a refined, nipping closure between radial digit tips. One may observe also that progress is not made with uniform speed for all objects. The rod, for example, seems adapted to palmar grasping, and grasping it by the digits occurs appreciably later than in the case of the cube, and later also than for the spoon. The cup proves to be a difficult object, and infants of all ages usually employ all digits in holding it. In the case of the bell, it is noteworthy that when the infants are very young they usually grasp the bowl, and as they mature they place the hand higher and higher on the handle, until at sixty weeks they are holding the top of the handle delicately between thumb and forefinger.

The large ball and the small pellet and string are more complicated. The great size of the ball and the absence of opposed surfaces make palmar contact essential at all ages. Improvement in the grasp with advancing age is indicated by the progressive increase in the angular separation of thumb and forefinger across the surface of the ball. Active opposition of thumb to fingers appears at thirty-six weeks.

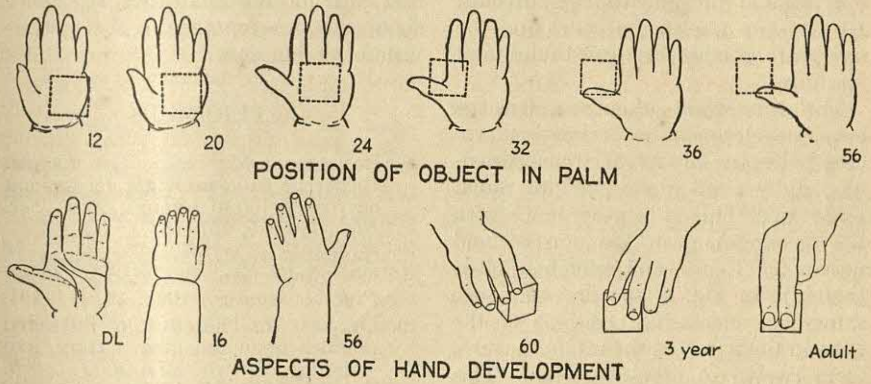

FIG. 3.—Change in position of object in palm during first year; developmental line of opposition in grasping; forearm of a 16-week infant; forearm of a 5–6-week infant; digital grasping at 6 weeks, at 3 years, and in adult life.

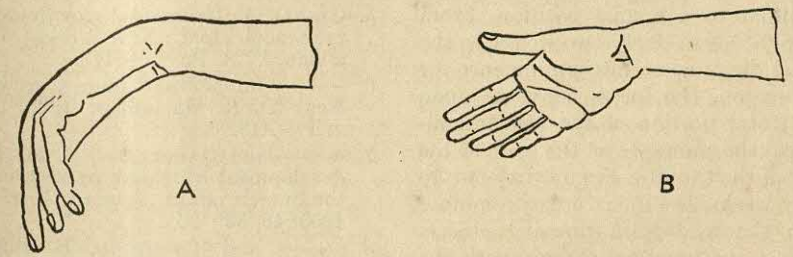

FIG. 4.—*A*, volar flexion of wrist; *B*, ulnar flexion of wrist.

The very small objects, pellet and string, require fine digital adjustments and are not usually grasped at all by infants under twenty-eight weeks of age. In the first attempts, the palm is brought down flat upon the object and the fingers are flexed in an attempt to close around it (2). Usually, however, the tiny object escapes entirely or else is caught with the finger tips high on the palm. The inactive thumb curls into the palm or rests against the radial surface of the index finger. At forty-four weeks, the index finger of the pronated hand flexes upon the pellet or string and the thumb adducts and pinches it against one of the radial fingers. With such small objects, thumb opposition is late in developing, since the negligible height of the objects requires that the infant hold his palm so flat and close to the table top that oppositional movements are difficult. At fifty-two weeks, the pellet and the string are grasped between thumb and forefinger.

For other objects, then, as well as the cube, development in prehension proceeds, despite minor variations, proximodistally from ulnar palm to radial finger tips. This is in accordance with the development of the muscles and nerves (*cf.* 19, 20, and references cited therein). In Fig. 3, the first sequence shows six successive positions of the cube in the hand, as the infant matures from twelve to fifty-two weeks. This may be taken as the general case. In the first three stages, *i.e.*, for the first six months of life, the cube is grasped in the palm and progresses gradually from an ulnar to a medial position. From twenty-four to thirty-two weeks, as the radial digits come into prominence for prehension, the forces converge upon the distal portion of the thenar eminence (the eminence on the palm at the base of the thumb). From thirty-two to forty weeks, the index finger combines with the medius in pressing objects against the proximal thumb, with the ring and little fingers participating if the object is large. From forty to sixty weeks, the infant grasps the object by pressure of the volar pads of the finger tips against the distal volar pad of the thumb.

The developmental line of opposition in grasping, as it advances gradually across the hand, is shown also in Fig. 3. To the left of this are drawn the forearms of infants of sixteen and fifty-six weeks, respectively, showing the manner in which the ulnar flexion of the wrist, during the important first year, prepares the hand for digital grasping by thumb and forefinger. The final drawings represent digital grasping by a sixty-weeks infant, a three-year-old child, and an adult, respectively, and demonstrate how closely the infant of little more than a year approximates in grasping precision the older child and even the grown man. Clearly, it is the first year of life that sees the most significant development in the mechanism of prehension.

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CHAPTER V

CONDITIONED RESPONSES IN HUMAN INFANTS*

M. A. WENGER

The Problem

In spite of the interest which has been displayed in conditioned responses since the pioneering work of Pavlov (8) and Bechterev (2), few experimenters have studied the earliest occurrence of this form of behavior in human ontogeny. The problem is an important one, for in addition to the theoretical and practical interest which accrues to it as a phenomenon of learning, the technique of conditioning has proved to be an extraordinarily useful tool in studies of perception and sensory discrimination. Knowledge of the postnatal development of sensory capacities would soon be greatly advanced if it should be found that stable and specific conditioned responses could be formed in the neonate. At the time of this study no unequivocal results had been reported.

A review of the literature in this field may be found in the complete report (12). It will not be reproduced here, but a summary of the limitations of these earlier studies of prenatal and postnatal conditioning is pertinent. The following comments may be made:

1. Few used a sufficient number of subjects to make generalizations valid.
2. Only one employed quantitative methods in treating the data.
3. In only three were the recordings made in an objective manner.
4. Most depended upon observations made by the experimenter only, and in no case was the reliability of the observations determined.
5. Only one of those in which the recordings were objective used a technique permitting precise measurements.
6. Only one used a response which does not occur with great frequency in young infants.
7. Only one used unconditioned subjects as controls.

From a review of the literature, the following conclusions were drawn:

1. It has not been unequivocally demonstrated that the fetus or neonate can be conditioned.
2. Adaptive responses to stimuli associated with feeding seem to appear toward the end of the first postnatal month.
3. Experimental conditioning has been reported by several experimenters by the third postnatal month.
4. Too little is known concerning the characteristics of the conditioning process during the first year of life to permit generalization.

Since work with fetuses presents great technical difficulties and appears inadvisable until it is known that the neonate can be conditioned, the problems discussed above resolve themselves into two fundamental questions concerning the genetic aspects of behavior: (*a*) Is neonatal conditioning possible? (*b*) If it is, how does it compare with human and infrahuman adult conditioning? The investigation reported here attempts to answer the first of these questions and to throw some light on the second.

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* An investigation of conditioned responses in human infants. This study was conducted in 1934–1935 at the Iowa Child Welfare Research Station, the State University of Iowa, Iowa City, Iowa. It is reported fully elsewhere (12). Adapted with permission of *University of Iowa Studies in Child Welfare.*

Technical Considerations

An investigation of conditioned responses in newborn infants presents certain difficulties not encountered when working with adult organisms. Pratt, Nelson, and Sun (9) and Buhler (3) have shown that a large part of early life is spent in sleep. Irwin (5) has found that when the infant is not asleep it is often engaging in mass activity. The time that the infant is awake and quiet is relatively short. Furthermore, Wenger and Irwin (13) have discovered that when the activity of the infant is restricted by binding, quiet not only ensues but also sleep. Since Pavlov has stated that conditioned responses cannot be formed during sleep and that the subject must be quiet and alert, the problem of securing an optimum condition of the infant becomes a major difficulty.

The choice of the unconditioned stimulus is another problem. The difficulty is appreciated when it is realized that, in general, responses of the neonate are not consistent. Furthermore, it is difficult to select a response which is specific and mensurable, yet one which can be elicited without direct contact by the experimenter.

Another problem lies in the selection of the conditioned stimulus. Although many stimuli can be found which elicit no response in the newborn, their use would be imprudent since it could not be known whether they were perceived. On the other hand, the behavior of the neonate is so variable that any stimulus which does cause reaction may elicit almost any sort of response of which the organism is capable.

After an analysis of the techniques already used in animal and human adult conditioning experiments and after some preliminary work in testing the effects of possible stimuli, it was decided that the lid reflex to a flash of light and the withdrawal response to electrotactual stimulation of the foot were two unconditioned infantile responses which satisfy the criteria outlined above. Since electrical shock causes considerable respiratory disturbance, the possibility of obtaining conditioned respiratory responses was also present. It was found further that tactual vibration applied to the plantar surface of the foot usually elicited slight dorsal flexion of the toe and ankle and sometimes leg retraction but did not seem to result in eyelid closure; rather, infrequent eye widening followed this type of stimulation. Accordingly, it was chosen as the conditioned stimulus for the lid-reflex experiments. Three stimuli were utilized in the withdrawal experiments: tactual vibration applied to the thorax, the usual response to which was a slight body squirming; a weak tone which elicited blinking, sometimes accompanied by segmental activity which was usually slight in magnitude; and a flash of light which always elicited eyelid closure or tightening but which was seldom followed by any other activity.

In addition to the experiments employing the responses elicited by light and electrical shock, a third type of experimentation was undertaken. For two infants who were available for continuous observation, a series of experiments was planned based upon the feeding reaction.

It will be seen that three types of experimentation have been outlined for this study, based on three different unconditioned responses. Although one technique might have been used, rigid adherence to a given technique seemed unwise for work in a field about which so little was known. Therefore this study definitely committed itself to exploration in the hope that it would serve to clear the ground for future research. With this in view, techniques and experimental conditions were altered whenever the results warranted.

Experiments Based on Lid Closure

Experiment I: The Conditioning of Lid Closure in Newborn Infants.—Three newborn infants were given paired stimulations of tactual vibration and light. Subjects *1F** and *2M* were placed in a Pratt experimental cabinet during experimentation. The cabinet has been described and pictured elsewhere (9, 11). When it is closed, the environment is comparatively well controlled. Observations were taken through a glass window in the side of the cabinet. A mirror placed at a 45-deg. angle above the infant made possible a clear view of the eyes at all times. The constant illumination of the cabinet was furnished by a 15-watt red photographic lamp. The paired stimulations were presented by a multiple rotary switch.

The unconditioned stimulus for the lid response was a flash of light from a 100-watt lamp placed 18 in. above the head of the infant. Its foot-candle rating at that distance was 45. The duration of the stimulation was 0.45 sec. The conditioned stimulus was a Hull tactual vibrator (1) attached to the plantar surface of the foot. The coil was activated by a 60-cycle alternating current reduced to 10 volts. The duration of the vibration was 3.4 sec. Three seconds after its incidence the light flashed.

Work with Subject 3, a son of the experimenter, was conducted in a separate room of a private hospital. Illumination was furnished by the same red lamp described above. The stimuli were also of the same nature, except that it was necessary to employ a lamp with a 60-watt rating since a current interrupter with a capacity of 60 watts was used to complete the light circuit. The lamp was placed closer to the infant's head in order to approximate the intensity of stimulation from a 100-watt bulb at 18 in. A hand button switch served to make the circuit activating the vibrator and to start the completion of the light circuit. The light flashed approximately 3 sec. after the incidence of the tactual vibrator. The circuit was then broken immediately.

Experiments with all infants were begun on the second postnatal day. Since the infants were discharged from the hospital on the morning of their tenth day, 8 or sometimes 9 days was the maximal period of experimentation. Throughout this and the following experiments stimulation was usually undertaken once a day, though on a few occasions experimentation was done both in the morning and in the afternoon. With some infants a day was omitted because of circumcision or other uncontrollable occurrences. The experimental period varied from 2 to 3 hr. An attempt was made to present 30 to 50 pairs of stimuli each day. Occasionally, owing to crying and activity or sleep of the infant, less than 30 stimulations were given. On several days it was possible to present more than 50. Stimulations were given at random intervals of from 45 sec. to 3 or more minutes. An attempt was made to stimulate only when the subjects were awake and quiet or only slightly active.

In the tabulation of the results, stimulations occurring during sleep or activity were regarded as unacceptable so far as judgment of response to the conditioned stimulus is concerned. Acceptable observation refers only to those made while the infant was awake and quiet or only slightly active. Slight activity is conceived to include mouth or sucking movements, slight

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* Through the following pages the letters *F* and *M* will be used to designate female and male.

respiratory irregularities, slight phasic segmental movements, slight general squirming or rolling, and slight whimpering. The infants were judged asleep when there prevailed the three conditions of continued quiescence, continued closure of eyelids, and continued regularity of respiration. The time and number of stimulations were recorded polygraphically. The reliability of the observations of lid closure, as determined by per cent of agreement of 2 observers on 87 observations on 4 infants, was .97.

Results.—The following tabulation shows the course of stimulation and development of the conditioned response in Subject 1.

It will be seen, for example, that on the eighth day 48 paired stimulations and 3 unreinforced tests with the vibrator were given. Of these 51 tactual stimulations, 45 were presented while the infant was awake and quiet or only slightly active. Of these 45 tactual stimulations, 26, or 58 per cent, resulted in lid closures.

	Postnatal day							
	2	3	4	5	7	8	9 (A.M.)	9 (P.M.)
Vibrator and light................	51	85	59	46	42	48	25	40
Vibrator only....................	0	0	1	1	1	3	12	17
Acceptable observations..........	51	85	60	47	43	45	35	53
Lid closures to vibrator..........	0	7	13	2	8	26	17	14
Per cent responses...............	0	8	22	4	19	58	49	26

Since the results of the first control experiment (see later) show that chance lid closure during the tactual stimulation is 29 per cent, the 58 per cent response obtained on the eighth postnatal day may be considered indicative of the appearance of conditioning. It will be seen that 5 days of training involving 283 paired stimulations preceded this increase in frequency of lid closure to the conditioned stimulus. It will be seen also that the conditioned reponse did not appear consistently during the 8 days of experimentation. On the last series (9 P.M.) of tests, much activity and crying occurred.

The next tabulation shows the course of stimulation and development of the conditioned response in Subject 2. Since the results of work with Subject 1 had been rather unsatisfactory, it was decided to use a brighter lamp (200 watts) as the source of the unconditioned stimulus. The only observable change in overt behavior of the infant was an increased frequency and vigor of head turning at the flash of the light and the appearance of a slight startle response in 6 of the 233 presentations. It will be seen from the tabulation that, after 3 days involving 124 paired stimulations, the tests on the fifth day resulted in 64 per cent response. Conditioning was therefore indicated 3 days earlier than in Subject 1. This finding agrees with the general knowledge that the greater the response to the uncondi-

	Postnatal day							
	2	3	4	5	6	7	8	9
Vibrator and light	50	30	44	12	50	37	10	0
Vibrator only....	0	0	6	5	5	30	36	48
Acceptable observations........	32	27	36	14	51	58	46	48
Lid closures to vibrator.........	5	5	13	9	16	22	20	34
Per cent responses	16	18	36	64	30	41	44	71

tioned stimulus the more rapidly conditioning occurs.

The following tabulation depicts the course of stimulation and development of the conditioned lid response in Subject 3. It will be seen that conditioning was much more slowly established in this infant than in Subject 2. Its first appearance was on the seventh day after 5 days of training involving 210 paired stimulations. No unreinforced stimulations were given since observations on this infant were to be continued (see Experiment II).

	Postnatal day						
	2	3	4	5	6	7	9
Vibrator and light	40	40	40	50	40	43	40
Acceptable observations	23	18	33	36	33	36	34
Lid closures to vibrator	6	6	7	12	6	28	25
Per cent responses	26	33	21	33	18	77	74

One other matter deserves mention here. It was noted that occasionally double or triple blinks occurred during the 3-sec. isolated presentation of the conditioned stimulus. They totaled 15 for all 3 subjects and ranged in frequency from 1 to 3 per day. In Experiment II it may be seen how their frequency increased as conditioning became more stable. These multiple blinks were never noted in the control experiments. It is believed that they furnish evidence, in addition to that presented by the control data, that the increased frequency of responses herein noted may be regarded as unstable conditioned responses.

First Control Experiment.—Two control experiments are necessary to warrant the conclusion that conditioning was obtained in Experiment I. First, it must be determined whether maturation can account for an increased frequency of lid closure to tactual stimulation.

Six infants, three females and three males, all in the ninth postnatal day, were subjected to the same experimental conditions described for Subjects 1 and 2 with two exceptions: (*a*) they had not been subjected to training with paired tactual-light stimulations; (*b*) on the day of experimentation the tactual vibrator stimulated the foot for its full duration of 3.4 sec., but was never followed by the flash of light. The results are shown in the following tabulation:

	Subject						
	4	5	6	7	8	9	Total
Acceptable observations	30	26	22	20	13	30	141
Lid responses	7	8	7	6	4	9	41
Per cent	23	31	34	30	31	30	29

It will be seen that the per cent of lid closure during tactual stimulation varied from 23 to 34 and that the mean per cent of response was 29. These results do not differ markedly from the first few records for the experimental infants. They differ markedly, however, from the experimental results on the ninth day.

It may be concluded from the above results that maturation during the lying-in period is not a factor in producing a marked increased frequency of lid response to tactual stimulation.

Second Control Experiment.—The second necessary control must determine whether repeated stimulation by a flash of light might result in a lowered threshold of the lid reflex. There are at least two methods for testing this question. (*a*) Repeated flashes of light may be presented to a group of infants from the second to the ninth days, followed by a series of tactual stimulations. (*b*) Frequency of spontaneous blinks in unconditioned infants may be compared with those infants who were thought to be conditioned.

The first of these methods perhaps is the more decisive. However, it seemed desirable to know whether conditioning with nocuous stimuli had produced a permanent effect upon the frequency of lid responses in the experimental infants. Accordingly follow-up observations were made on the three experimental infants and observations were made on a group of 29 unconditioned infants. The age range was twenty-three to two hundred ten days. The observations consisted of recording number of eyelid closures occurring during samples 1 min. in duration. Preliminary observations indicated that five 1-min. samples gave a mean sufficiently reliable for the purposes of this experiment. Although conditions of illumination were not controlled, observations under different conditions for the same infant indicate that illumination has little if any influence upon the rate of spontaneous blinking. It seemed to make no difference whether the infant was observed before or after feeding or whether he was observed during quiescence or slight activity.

The following tabulation shows that the mean number of spontaneous lid closures during 1 min. was 5.5. It shows further that age and sex differences were negligible. The highest frequency of blinks recorded during any sample was 16; the lowest was 0. The latter occurred in only three infants. The range of means was 1.4 to 10.9.

Group	Number of subjects	Mean
Male...............	17	5.0
Female............	12	6.3
Oldest.............	10	5.1
Youngest..........	10	5.8
Total...............	29	5.5

Observations upon the experimental infants involved 15 to 20 samples on each subject. They were observed in their homes at the ages of one hundred forty-nine, one hundred twenty, and eighty-eight days. The results are compared with the control data in the next tabulation. Although their mean lid closures were higher than the control mean, all were well within the normal range. Four of the 29 control infants showed a higher mean than the highest of the experimental infants.

	Range	Mean
Experimental subject 1.	3 to 10	5.7
Experimental subject 2.	3 to 12	6.4
Experimental subject 3.	3 to 17	8.7
Control subjects.......	0 to 16	5.5

These data make possible the conclusion that repeated stimulations by a flash of light have little if any effect upon the later rate of spontaneous blinking and therefore that the increased frequency of lid closure during tactual stimulation found in the experimental infants cannot be explained as merely a lowered threshold of the lid response.

The control experiments have eliminated the possibility that the increased frequency of lid closure found in the experimental infants might be explained in terms of maturation or of increased frequency of spontaneous blinking. It must be concluded that the results of the experiment on conditioning lid closure represent true conditioned responses in neonates.

Experiment II: Continued Study of the Conditioned Lid Response.—As has been stated, conditioning was undertaken with Subject 3 under less well controlled conditions because he was to be available for continued observation. Experiments continued at his home under practically the same experimental conditions described for him in Experiment I, with the exception that stimulations were not undertaken daily. Table 1 (a continuation of the data on page 71) shows the course of continued stimulation and development of the conditioned response.

TABLE 1.—RESULTS OF CONTINUOUS STUDY OF THE CONDITIONED EYELID RESPONSE IN ONE INFANT

Postnatal day	Light and vibrator	Vibrator only	Acceptable observations	Lid closures	Per cent responses	Multiple lid closures
After tests during first 9 postnatal days						
13	15	0	9	7	77	2
23	40	0	36	20	55	1
33	40	0	40	21	53	1
35	25	0	20	10	50	0
47	40	0	36	18	50	2
48	28	2	22	11	50	2
53	9	16	22	16	76	0
56	15	15	26	9	35	0
After period of 53 days						
109 (A.M.)	0	10	8	6	75	1
109 (A.M.)	5	0	5	3	60	0
109 (P.M.)	0	10	10	5	50	0
109 (P.M.)	45	0	40	14	35	1
110	30	0	28	19	68	4
111	30	0	30	25	83	11
112	40	0	40	32	80	8
After period of 65 days						
177	0	40	40	13	27	0
180	0	10	10	4	40	0
180	40	0	40	13	33	3
181	40	0	36	32	89	8
183*	0	10	10	0	0	0
183	0	40	40	23	58	2

* Tests during which illumination for photography inhibited lid responses.

It will be seen that although experimentation on the thirteenth postnatal day resulted in a 77 per cent response to tactual stimulation, that value was not maintained during the succeeding tests.

It is of interest that the first 10 tests on the morning of the one hundred ninth day gave 75 per cent lid closure. Retention of the conditioned response over a period of 53 days was thus indicated. Retention was not indicated, however, by the forty tests on the one hundred seventy-seventh day, after an interval of 65 days. The per cent of response was only 27. The per cent for the first 10 tests was 40, little greater than chance. Although it is true that a positive indication of retention is more convincing than a negative one, since unknown factors might have interfered with the responses on the day in question, the matter of absolute retention is one for future experimentation. Nevertheless, the effect of previous experience probably appeared in another form. Although the response was no greater than chance on the one hundred seventy-seventh and one hundred eightieth days after an interval of 65 days, only 1 day of training involving

40 paired stimulations was necessary to produce the highest per cent of response recorded throughout the experiment. Unless it can be established that six-month-old infants can be conditioned in this number of trials, some evidence of retention is exhibited in this instance.

Two considerations remain. First, it must be pointed out that this infant did not manifest 100 per cent stable responses at any time during the experimentation. Second, can these responses be explained as other than conditioned? The second control of Experiment I is applicable here. At least on the eighty-eighth day the responses cannot be explained in terms of increased frequency of spontaneous blinking. Furthermore, another control was conducted with this infant. On days in which the per cent of response was high, a number of 3-sec. observations of lid closure were taken during which the tactual stimulus was not presented. The results are shown in the next tabulation:

	Postnatal day			
	53	112	181	183
3-sec. observations..	15	32	10	20
Lid closures........	3	13	1	4
Per cent responses..	20	41	10	20

Although 41 per cent chance response was recorded on one day, on the one hundred eighty-first day when the conditioned response reached its highest frequency chance response was only 10 per cent. These observations complement the second control experiment for Experiment I. It becomes impossible to regard the increased frequency of blinking during tactual stimulation as a spurious result. Also, attention should be called to the increased frequency of multiple lid closures (double or triple blinks occurring during the isolated presentation of the tactual stimulus shown in Table 1) as the stability of the conditioned response increased. These multiple blinks were never observed in other than the experimental infants. It is believed that they correspond to the several anticipatory flexions of the eg noted by Liddell (7) in sheep and are indicative of true conditioned responses.

Experiments Based on Withdrawal Responses

General Procedure and Apparatus.—Since stable conditioning of lid closure in newborn infants had not been achieved, attention was turned toward attempts to obtain stable conditioned withdrawal responses. The general condition and procedure for these experiments was the same as that employed for Subjects 1 and 2 in the experiment on conditioning lid closure. All were conducted in the experimental cabinet, which was illuminated now by a 25-watt white lamp. The duration of stimuli remained the same. Protocols based upon direct observation supplemented the objective polygraph records. Several techniques were employed to record leg withdrawal. For their detailed description the reader is referred to the original source (12).

The electrotactual stimulus which served to elicit the unconditioned response was derived from the discharge of a condenser bank. Although such an apparatus necessitates charging the condensers before each stimulation, the task is not great, and it results in one shock rather than in a series of shocks. Furthermore, it elicits a specific form of behavior in infants or adults which is not observed when stimulation is by an inductorium. This response is a flexor twitch of the muscle group stimulated and is quite different from the withdrawal response which may follow it. For these experiments the effective electrode was fastened to the plantar surface of the left great toe. The diffuse electrode was fastened over the peroneus longus muscle of the left calf. The flexor twitch with the electrodes thus placed usually appeared in all the toes and sometimes in the ankle also, depending upon the position of the diffuse electrode and upon the intensity of the shock. Frequently the twitch was bilateral. The other components of response to electrotactual stimulation vary as intensity increases, in a rather regular progression. The order of the complete overt response was flexor twitch, leg retraction, Moro reflex, facial grimace, whimpering, and crying. During the stimulations the capacity of the condenser bank was frequently readjusted in order to give the maximum consistency of response with the minimum of crying or whimpering.

Experiment III: Conditioning of the Withdrawal Response to Tactual Vibration.—This experiment involved only one infant, Subject 10*M*. The conditioned stimulus was the tactual vibration used in Experiments I and II, here activated by 7½ volts alternating current. Since application of this stimulus to the foot frequently elicits retraction of the leg, it was necessary to apply the stimulus elsewhere. In this case the vibrator was fastened over the sternum.

Results.—The following tabulation shows the nature and frequency of the various responses to electrotactual stimulation.

	Postnatal day						Total	Per cent*
	2	3	4	5	6	7		
Shocks	19	33	30	55	52	45	234	
Questionable response	0	4	7	6	0	0	17	7
Flexor twitch	19	26	24	51	51	44	215	99
Retraction of legs	0	7	1	7	0	19	34	16
Moro reflex	0	7	4	22	28	10	71	33
Slight segmental activity	0	2	1	3	9	8	23	11
Whimper	0	2	6	2	8	10	28	13
Cry	0	4	3	4	3	2	16	7

The only consistent reponse is seen to be the flexor twitch, which occurred in over 99 per cent of the stimulations. Respiratory responses have not been included in the tabulation since the breathing of this infant was too irregular.

The next tabulation shows the course of stimulation and development of the conditioning process. In the tabulation, "slight responses" include flexions of the toes or ankles, partial retraction of the legs, body squirming, and the facial grimace. They always involve the left leg (the one to which the unconditioned stimulus was applied) but do not include instances when the right leg only was concerned. "Full responses" include complete

	Postnatal day						
	2	3	4	5	6	7	9
Vibrator and shock	19	33	30	55	52	45	0
Vibrator only	3	4	1	9	8	32	16
Acceptable observations	20	27	23	34	41	57	14
Slight responses	0	5	3	7	7	11	3
Per cent	0	19	13	21	17	19	21
Full responses	0	3	6	3	4	5	4
Per cent	0	11	26	10	10	9	29
Total responses	0	8	9	10	11	16	7
Per cent	0	30	39	29	27	28	50

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* Since 17 of the 234 shocks occurred during activity and rendered judgment of the response questionable, the percentages shown are based on 217 stimulations.

retraction of both legs, jerking of the legs, the Moro reflex, or any response which had crying or whimpering as a component.

It may be seen that frequency of response to tactual stimulation in this infant showed no increase until the ninth day. The question arises whether the increase observed on that day can be regarded as significant. Activity interfered with the ninth-day tests to such an extent that only 16 were possible, 14 of which permitted acceptable observation. The sampling is hardly sufficient to be considered reliable. On the other hand, certain observations seem to indicate that conditioning occurred. It was seen that the flexor twitch of the toes or toes and ankles was the only consistent response to the unconditioned stimulus. A response to the conditioned stimulus very similar to the flexor twitch was noticed in this infant. Sometimes it was followed by a leg retraction or Moro response or whimpering just as though a shock had been given. The following tabulation shows the frequency and per cent of acceptable observations at which this response occurred. Those occurring in the right foot only were omitted. It will be seen that this response first appeared on the fourth day and reached its maximum on the ninth day. Although the differences are not large, this type of response has seldom been observed in unconditioned infants. It was quite different from the toe fanning or clonic ankle movements described by Pratt, Nelson, and Sun (9).

	Postnatal day						
	2	3	4	5	6	7	9
Acceptable observations	20	27	23	34	41	57	14
Flexor twitch to conditioned stimulus	0	0	3	10	5	8	6
Per cent flexor twitch	0	0	13	30	12	14	43

This flexor twitch was also frequently observed in the spontaneous behavior of the infant between stimulations. Its incidence had increased to such a noticeable frequency by the ninth day that a control observation was made. During an 8-min. period the following results were obtained:

Flexor Twitch	Frequency
Left toes	13
Right toes	3
Bilateral	12
Total	28

Such a finding might be expected if the infant had become conditioned to casual stimuli in the environment. It raises the question whether the tactual vibration was perceived in all of the stimulations for, in spite of preliminary work on other infants which indicated that it would be satisfactory, this infant did not respond to it regularly. Moreover, during the latter part of the experiment, as general activity increased, slashing of the arms often dislodged the vibrator and required much readjustment. It was determined, therefore, to change the nature of the conditioned stimulus in subsequent experimentation.

In conclusion it may be said that conditioning was indicated in this infant, but was not unequivocally demonstrated. Since only one infant was used with this type of stimulation, no special controls were conducted. However, the second control study of Experiment IV furnishes evidence that the increased frequency of response noted on the last day was not merely the result of repeated electrotactual stimulation.

Experiment IV: Conditioning of the Withdrawal Response to Auditory Stimulation.—This experiment differs from Experiment III in that a relatively pure tone served as the conditioned stimulus. Five subjects were used. The source of the conditioned stimulus was an audio-oscillator. The speaker was placed 18 in. behind the subject's head. The frequency of the tone was about 1084 cycles, and its intensity was approximately 50 decibels above the adult human threshold, an intensity which corresponds to that of the normal speaking voice.

The responses which the subjects of this experiment made to electrotactual stimulation did not differ markedly in character from those already described for Subject 10 in Experiment III. In general, however, a stronger shock was presented. The frequency of full responses (complete leg retractions, Moro reflexes, whimpering, crying) was increased to almost 100 per cent of the stimulations. With this greater magnitude of response, a similar frequency of respiratory gasps was also obtained.

First Control Experiment: Unconditioned Responses to the Conditioned Stimulus.—Seven infants were given a series of auditory stimulations on their ninth postnatal day. The tone was the same as that used for the experimental subjects. The tests of course were never followed by electrotactual stimulations, nor had any paired stimulations preceded them. The results are given in the following tabulation.

	Subject							Total	Mean
	16	17	18	19	20	21	22		
Auditory stimulations	31	30	36	48	50	14	38	247	
Acceptable observations	24	25	22	28	12	8	19	138	
Slight responses	2	3	1	15	0	1	2	24	
Per cent	8	12	5	54	0	13	11		17
Full responses	1	6	1	2	2	0	2	14	
Per cent	4	24	5	7	17	0	11		10
Total responses	3	9	2	17	2	1	4	38	
Per cent	12	36	9	61	17	13	21		28
Respiratory gasps	8	8	4	5	4		2	31	
Per cent	33	32	18	18	33		11		22

It will be seen that the mean per cent of all responses involving the left leg was 28 and that the majority of this value is comprised of slight responses. Full responses occurred in only 10 per cent of the stimulations. The mean number of respiratory gasps for the group was 22. Since the gasp was the only consistent respiratory response to electrotactual stimulation, it is the only one given consideration here.

Second Control Experiment: Effect of Repeated Electrotactual Stimulation.—In addition to the unconditioned response to auditory stimulation, it is necessary to consider the effect which repeated presentations of a given stimulus may have upon the frequency of the responses which it elicits. It already has been suggested that the result might be a lowered threshold of reponse. Accordingly, a second control experiment was conducted. Four subjects were given 30 shocks per day for 7 days and on the ninth postnatal day were tested with the tone previously described. The results are shown in the tabulation appearing at the top of page 78.

The mean per cent of total withdrawal responses was 38, slightly greater than the value obtained with the first control group. Again most of the responses were slight. In fact, fewer full responses were obtained with this group than with the other. The mean per cent of respiratory gasps was 19. None of the subjects was atypical.

As a result of these two control experiments, it may be said that, if the experimental infants show a mean motor response higher than 38 per cent, the presence of some modification of behavior will be indicated. For indi-

	Subject				Total	Mean
	22	23	24	25		
Shocks preceding auditory stimulation	210	210	210	180		
Days of electrotactual stimulation	7	7	7	6		
Tones on ninth day	31	30	32	20*	113	
Acceptable observations	25	23	28	19	95	
Slight responses	6	12	12	4	34	
Per cent	24	52	43	21		36
Full responses	1	0	1	0	2	
Per cent	4	0	4	0		2
Total responses	7	12	13	4	36	
Per cent	28	52	46	21		38
Respiratory gasps	6	3	5	4	18	
Per cent	24	13	18	21		19

* This infant was tested on the eighth day, since he had contracted conjunctivitis and was to be placed in isolation.

vidual subjects the criterion would of course be higher. The respiratory responses must exceed only 22 per cent for conditioning to be evident. The results for the experimental infants are next considered.

Results for Subject 11*M*.—The following tabulation shows the course of stimulation and development of the conditioned withdrawal and respiratory responses in this subject. The results are graphically presented in Fig. 1. It will be seen that both withdrawal responses and respiratory gasps showed a steady increase and that unreinforced tests on the morning and evening of the ninth day obtained a high percentage of both responses. Indications of conditioning appeared at least by the eighth day, after 4 days of stimulation involving 141 paired presentations of tone and shock. The conditioned response was most frequently a full Moro reflex without crying, although sometimes whimpering or crying accompanied it. The flexor twitch preceded it infrequently. Although the total per cent of withdrawal responses was not significantly different from that obtained from the control infant, Subject 19*F*, the per cent of full responses was quite different. Furthermore, the differential in respiratory gasps was 60 per cent. It appears that unstable conditioned responses were established in this subject.

	Postnatal day						
	3	4	6	7	8	9 (A.M.)	9 (P.M.)
Tone and shock	20	35	67	19	16	0	0
Tone only	2	8	25	12	23	22	22
Acceptable observations	22	42	80	31	39	22	21
Slight responses	0	4	6	5	5	5	1
Per cent	0	10	7	16	13	23	5
Full responses	0	2	10	2	13	10	13
Per cent	0	5	13	6	33	45	62
Total responses	0	6	16	7	18	15	14
Per cent	0	12	20	23	46	68	67
Respiratory gasps			5	10		14	14
Per cent			6	32		64	67

	Postnatal day						
	3	4	5	6	7	8	9
Tone and shock	22	38	36	41	20	13	0
Tone only	4	6	11	11	32	36	44
Acceptable observations	23	40	45	37	36	41	23
Slight responses	1	1	2	1	5	7	8
Per cent	4	2	4	3	14	17	35
Full responses	2	7	4	8	13	21	11
Per cent	9	18	9	22	36	51	48
Total responses	3	8	6	9	18	28	19
Per cent	13	20	13	24	50	68	83

Results for Subject 12*M*.—The data for this infant are shown in the next tabulation and graphed in Fig. 1. It will be seen that a decided increase in per cent of response occurred on the seventh day, after 137 paired stimulations distributed over 4 days. Here again the most frequent response was the Moro reflex, usually without crying. Flexor twitches were less frequent components of the conditioned response than was the case with Subjects 10 and 11. Respiration was so irregular that the records were not used. As with Subject 10, stimulations which occurred at the infrequent periods of regular respiration gave evidence that the respiratory gasp was also a component of the conditioned response in this subject.

It is of some interest that this infant was one of identical twins as judged by single placenta and chorion and by identical appearance. The other twin was Subject 16*M* of the first control experiment. A differential of 71 per cent withdrawal response to the same auditory stimuli was found between these infants on their ninth postnatal day. If the co-twin method offers a valid experimental control, further evidence is thus furnished that conditioned responses were established in this infant.

Results for Subject 13*M*.—The next tabulation shows the essential data for Subject 13, and the results are graphically presented in Fig. 1.

	Postnatal day							
	2	3	4	5	7	8	9 (A.M.)	9 (P.M.)
Tone and shock	32	61	49	38	27	41	18	0
Tone only	4	3	1	1	18	30	31	54
Acceptable observations	3	22	20	18	17	19	40	38
Slight responses	3	2	4	7	5	9	4	12
Per cent	100*	9	20	39	29	47	10	32
Full responses	0	2	1	1	7	4	12	19
Per cent	0	9	5	6	41	22	28	50
Total responses	3	4	5	8	12	13	16	31
Per cent	100*	18	25	44	71	68	40	82
Respiratory gasps		0						28
Per cent		0						74

* These values are of course spurious. The infant was either asleep or active on all but 3 of the 36 stimulations.

It will be seen that evidence of conditioning appeared on the seventh day, after 180 paired tone-shock stimulations distributed over 4 days. Many of these stimulations occurred during sleep. Respiratory measures for only the second and last series of tests are available for this subject. On the third day no respiratory gasps were found. On the last series of ninth-day tests, 28 or 74 per cent were recorded. Again the

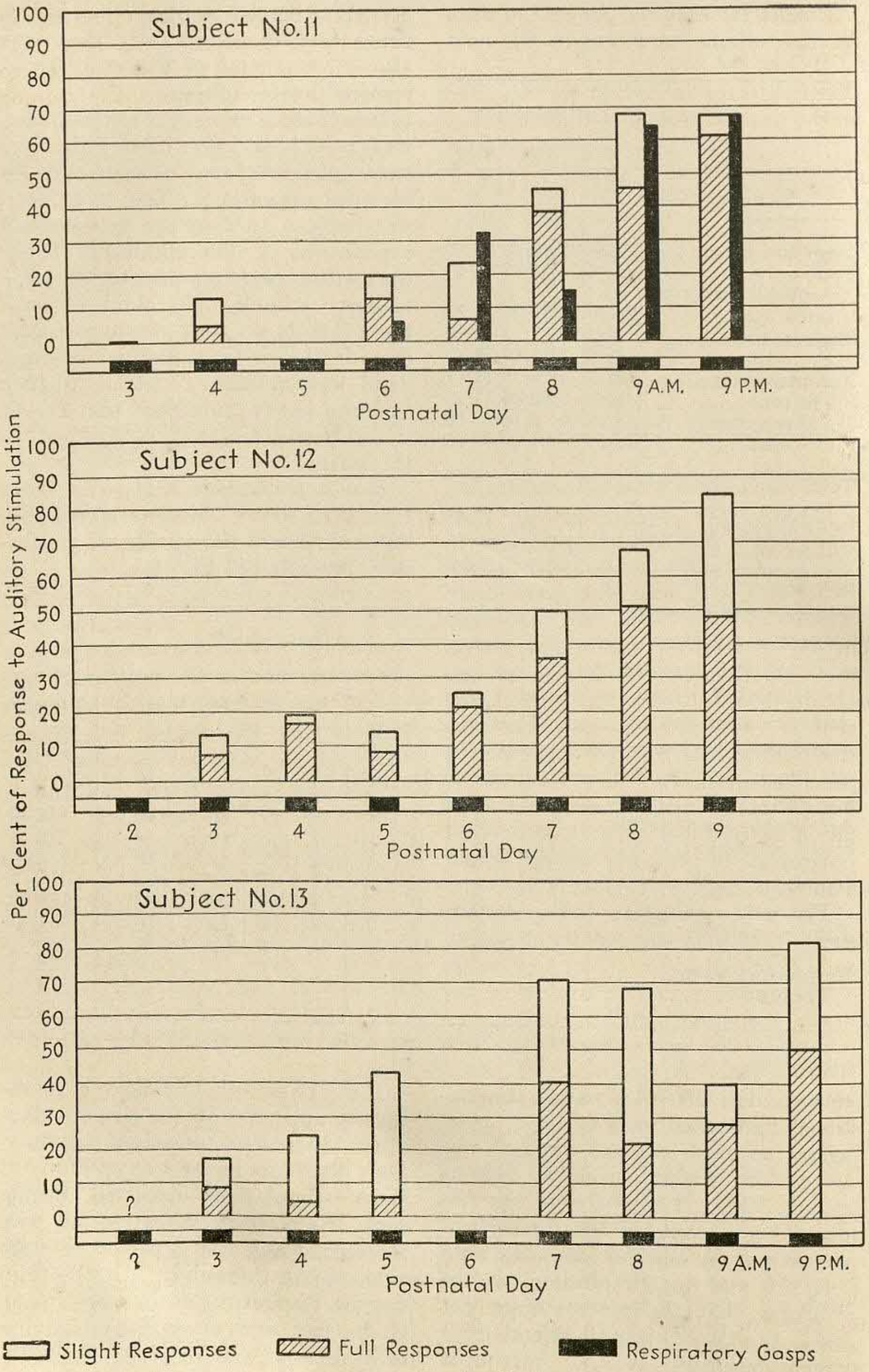

FIG. 1.—Development of conditioned withdrawal and respiratory responses to tone in three newborn infants. (*From Univ. Ia. Stud. Child Welf.*, 1936, **12,** *No.* 1, *p.* 52.)

correspondence to the per cent of withdrawal response may be seen.*

Results for Subjects 14F and 15M.—The results for Subject 14 are presented in the next tabulation and are graphed in Fig. 2. The tabulation shows that the highest per cent of motor responses obtained was 40 and the highest per cent of respiratory gasps was 24. In the light of the control experiments previously described, these results cannot be considered indicative of conditioning to tone, even though some progression in per cent of response was evident.

	Postnatal day								
	2	3	4	5	6	7	8	9	9*
Tone and shock	40	30	30	30	30	30	31	6	0
Tone only	0	2	0	0	1	0	4	30	20
Acceptable observations	39	32	28	23	29	24	29	36	20
Slight responses	3	4	5	1	7	2	8	9	5
Per cent	8	13	18	4	24	8	27	25	25
Full responses	2	1	0	0	2	0	2	5	3
Per cent	5	3	0	0	7	0	7	14	15
Total responses	5	5	5	1	9	2	10	14	8
Per cent	13	16	18	4	31	8	34	39	40
Respiratory gasps	1	4	0	1	2	3	7	5	
Per cent	3	13	0	4	7	13	24	14	

* Twenty additional tests without camera.

The next tabulation (see page 82) shows that only slightly better results were obtained with Subject 15.

The increase in per cent of withdrawal responses noted on the last day occurred entirely in the "slight response" category and was not much greater than the per cent of unconditioned responses to tone of control Subject 19. No marked increase in respiratory responses was found. It must be concluded that this infant also showed little evidence of conditioning to tone.

At least two interpretations of the above results are possible. Either these two infants were not conditionable, or extraneous noise during the experiments with the two subjects interfered with the conditioning process. Certain of the data indicate that the second interpretation is more tenable. These two subjects gave many spontaneous leg jerks and indulged in much crying during the latter days of experimentation. This increase in frequency of spontaneous full response has been noted in all the infants who have been subjected to repeated electrotactual stimulation. It is believed to be indicative of conditioning to other stimuli in the experimental environment.

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* Two months after Subject 13 was discharged from the hospital and before experimentation had begun with Subject 14 or the second control group, he was observed in his home for the purpose of discovering whether there were any deleterious effects from the repeated electrotactual stimulation to which he had been subjected. Subject 10 was also seen at the age of four months. Unfortunately it was impossible to locate Subject 11 or the identical twins. Both of the infants seen were found to be in good health and well developed. The parents reported no excessive crying or activity and no jerkiness of the limbs. No unusual behavior was noted by the writer during observations of approximately 20 min. in both cases.

	Postnatal day							
	2	3	4	5	6	7	8	9
Tone and shock. .	30	30	30	30	30	35	30	5
Tone only.	0	0	0	0	0	0	0	30
Acceptable observations.	13	28	30	27	25	30	25	33
Slight responses. .	0	5	7	6	8	3	9	21
Per cent.	0	18	23	22	32	10	36	64
Full responses. . . .	0	0	0	2	1	0	0	1
Per cent.	0	0	0	7	4	0	0	2
Total responses. . .	0	5	7	8	9	3	9	22
Per cent.	0	18	23	30	36	10	36	66
Respiratory gasp. .	1	2	0	4	1	0	0	3
Per cent.	8	7	0	15	4	0	0	9

Summary.—The main results of this experiment may be seen in summary in lower part of Fig. 2. Comparison with control results shows some modification of behavior after the conditioning process in at least three of the experimental subjects and suggests it in the other two subjects by the increased per cent of slight withdrawal responses. Unstable conditioning was therefore decisive in three subjects and equivocal in two. It has been pointed out, however, that all subjects gave indications of having become conditioned to other stimuli in the environment.

Experiment V: Conditioning of the Withdrawal Responses to Visual Stimulation.—Since results in Experiment IV were indecisive for some subjects, it was decided to explore the possibility of conditioning to visual stimuli. The general experimental conditions, procedure, and apparatus remained the same as in Experiment IV, except that light served as the conditioned stimulus. The source of light was the 100-watt lamp used as the unconditioned stimulus in Experiment I. Again its position was 18 in. from the infant's eyes.

Although work was begun with four subjects, complete data are available for two, 30*M* and 31*M*. Experiments were started with the 25-watt white lamp furnishing constant illumination in the experimental cabinet. After the fifth day of Subject 30 and the seventh day of Subject 31, it was thought that the conditioned response might be occurring to the light when the infant's eyes opened after having been closed. Therefore the 15-watt red bulb used in Experiments I and II was substituted. The latter was used during the control experiment.

Control Experiment: Unconditioned Responses to the Conditioned Stimulus.—It has been noted in Experiment I that infants manifest little response to a flash of light except eyelid closure or tightening and head turning. The duration of the stimulus in Experiment I was only 0.45 sec. In this experiment the longer duration of 3.4 sec. was used. Therefore a control experiment was conducted with three subjects on their ninth day to determine the effect of visual stimulation of this duration. The results are shown in the following tabulation.

	Subject			Total
	33	34	35	
Visual stimulations on ninth day.	30	30	30	90
Acceptable observations.	30	30	24	84
Slight responses.	4	1	5	10
Per cent.	13	3	21	12
Full responses.	1	0	0	1
Per cent.	3	0	0	1
Total responses.	5	1	5	11
Per cent.	17	3	21	13
Respiratory gasps.		4	1	5
Per cent.		13	4	9

It will be seen that the highest per cent of response was 21 and that the mean per cent for the three infants was 13. The highest per cent of respiratory gasps was 13. It should be noted that full responses (whimpering or crying with or without complete retractions or Moro reflexes) constitute only 1 per cent of the group mean response. Additional control data are afforded by the

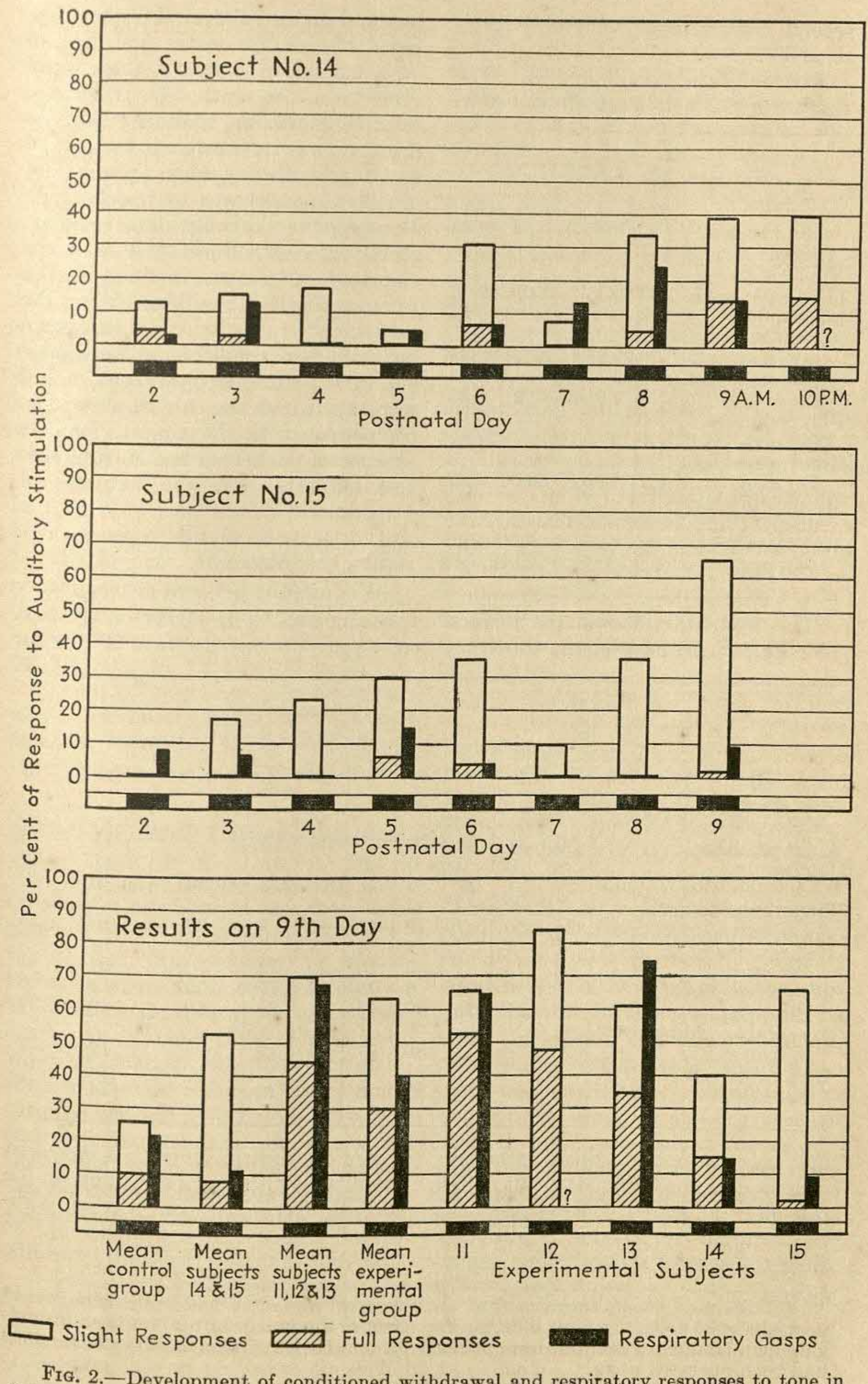

FIG. 2.—Development of conditioned withdrawal and respiratory responses to tone in two newborn infants, and a comparison of seven control and five experimental subjects on ninth postnatal day. (*From Univ. Ia. Stud. Child Welf.*, 1936, **12**, *No.* 1, *p.* 58.)

second control experiment of Experiment IV.

Results for Subjects 30 *and* 31.—The results for Subject 30 are shown below.

	Postnatal day							
	2	3	4	5	6	7	8	9
Light and shock	30	30	30	15	29	24	29	6
Light only	0	0	0	0	1	2	6	24
Acceptable observations	30	29	24	14	27	24	22	25
Slight responses	2	2	11	4	9	5	1	5
Per cent	7	7	46	39	33	21	5	20
Full responses	0	3	0	0	0	18	6	3
Per cent	0	10	0	0	0	75	27	12
Total responses	2	5	11	4	9	23	7	8
Per cent	7	17	46	39	33	96	34	32
Respiratory measures	15	15	30	15	24	23	22	25
Respiratory gasps	0	5	5	0	6	20	7	12
Per cent	0	33	17	0	25	87	32	48

This tabulation shows that respiratory gasps increased on the third day but again decreased. Slight responses increased on the fourth day, but no full responses appeared. These responses can hardly be regarded as conditioned, since the subject showed more respiratory and slight withdrawal responses to visual stimulation on the first days of experimentation than did the control subjects on the ninth day. It is questionable, moreover, whether conditioning alone was responsible in Subject 30 on the seventh day when the per cent of full responses was extremely high. It represents the only data collected shortly after a subject had been circumcized. Perhaps it indicates a hypersensitivity resulting from the operation.* In spite of these facts, indications of conditioning were present in the increased per cent of full responses which the subject showed in comparison with the almost complete absence of such responses in the control subjects and the subjects of Experiment I.

The next tabulation presents the results for Subject 31.

	Postnatal day									
	2	3	4	5	6	7	8	9 (A.M.)	9 (P.M.)	10
Light and shock	30	31	30	30	28	30	15	5	15	0
Light only	0	0	0	0	0	0	15	27	11	30
Acceptable observations	29	31	27	30	27	17	23	20	20	22
Slight responses	7	2	2	5	11	8	2	6	2	5
Per cent	24	6	7	17	41	47	9	30	10	23
Full responses	1	4	2	1	4	4	5	6	10	3
Per cent	3	13	7	3	15	23	22	30	50	14
Total responses	8	6	4	6	15	12	7	12	12	8
Per cent	28	19	15	20	56	71	30	60	60	36
Acceptable respiratory measures	10	16	15	30	27	17	19		19	22
Respiratory gasps	3	3	8	11	9	13	3		14	10
Per cent	33	19	53	37	33	76	16		74	45

Although the per cent of respiratory gasps is seen to be higher on the first series of stimulations than it was for any of the control subjects, it increased irregularly with a marked jump on the seventh day. The per cent of withdrawal response is also higher on the first day than for the control results, but it, too, increased irregularly with a jump on the sixth day. Conditioning was thus indicated by the sixth or seventh day. The decrease on the tenth day can possibly be attributed to experimental extinction.

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* This observation suggests that an uncontrolled factor has been operative in previous work with newborn infants. The effect of circumcision has not been investigated, and few experimenters have pointed out that they excluded infants who recently had been operated upon.

Summary.—Comparison of the results of the two experimental subjects and the three control subjects demonstrates a decided difference in their withdrawal and respiratory responses to visual stimulation on the ninth postnatal day. Although both of the experimental subjects seemed more reactive during the early days of the conditioning process than the control infants on the ninth day, increases in responses within the data of the former, as well as supplementary control observations, indicate that some modification of behavior may be said to have occurred by the seventh postnatal day, after about 150 paired light-shock stimulations. The mean per cent of withdrawal responses recorded for the experimental subjects was 46. Of this value, 26 per cent were full responses. The mean per cent of respiratory gasps was 61. Comparative values for the control group were 13, 1, and 9 per cent respectively.*

Some General Considerations

In summary it may be said that evidence of conditioned responses was obtained in six infants (Subjects 1, 2, 3, 11, 12, and 13). Conditioning seems probable in two others (Subjects 30 and 31). Three others showed some indication of conditioning at least to stimuli in the environment other than the conditioned stimuli (Subjects 10, 14, and 15). The continued high per cent of lid response in one infant (Subject 3 of Experiment II) gave further indication that the results obtained on the seventh and ninth days were not spurious.

Concerning the facility with which conditioned responses were established in the infant subjects of these experiments, it was seen that the earliest evidence of conditioning appeared on the fifth postnatal day in Subject 2 of the conditioned lid response experiment, after 3 days of stimulation involving 124 pairs of stimuli. The other infants required 4 to 5 days of training, involving 210 to 238 paired stimulations. Hilgard (4) found 1 to 21 stimulations necessary to establish conditioned lid responses in five human adults. Some further stimulation was needed before the response approached stability. The difference is more striking for the conditioned withdrawal response, for which Liddell (7) has stated that only five paired stimulations are necessary for the pig and only six for the sheep. Razran (10) reports a mean of ten stimulations as necessary for establishing various conditioned responses in children seven to nineteen years of age.

Another significant finding is that conditioned responses in these neonates did not become stable. Large individual differences were seen. The highest per cent of response reached during the stimulations was 83 for the total withdrawal responses of Subject 12 on the ninth day. The group mean was 63 per cent, slightly lower than the mean of 69 per cent for Experiment I. Even at the age of six months, Subject 3 manifested considerable irregularity in per cent of lid closure on different test series, the highest value reached being 89. Frequent regressions were noted in most subjects. Since Hilgard (4) reported this same instability for conditioned eyelid responses in the adult, only the variability of the gross motor responses need be considered as peculiar to infants.

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* One other form of conditioning was explored (Experiment VI of the original report), which involved the presentation of intermittent auditory stimulation during the feeding periods of two newborn infants. Owing to lack of space the rather indecisive results are not reproduced here. Kantrow (6) recently has published a careful study of conditioned feeding responses in human infants.

At least three conditions are believed to have interfered with the stability of conditioned responses in infants. They probably influenced the process of conditioning also. They are competing reactions, drowsiness, and cataleptoid immobility. The third of these states was observed frequently in this study. In infants it is distinguishable by immobility, even of the eyeballs; tonic extension or contraction of the segments; depressed and very regular respiration, which at times shows a tonic block; and often increased latency and decreased amplitude of response. In the opinion of the writer, at least one-half of the times that infants are observed to be awake and quiet, this cataleptoid picture may be observed. In the light of this comment it would appear that more refined descriptive categories of muscular conditions are needed in infant research.

From this series of experiments it is possible to draw the following conclusions.

1. It is possible to establish some forms of conditioned responses in some newborn infants. Best results were obtained with the conditioned lid response to tactual vibration of the foot and the conditioned withdrawal and respiratory responses to auditory stimulation.

2. Conditioning in the neonate is unstable and not easily obtained. These factors make it difficult if not impossible to investigate systematically many of the characteristics of conditioned responses in neonates.

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CHAPTER VI

MENTAL GROWTH DURING THE FIRST THREE YEARS*

NANCY BAYLEY

Introduction

Early trends in mental growth, such as may be observed in the maturing behavior of infants during the first two or three years of life, should be of considerable value in clarifying theories of intelligence. The mental behavior of infants, being genetically prior to, and less complex than, that of school-age children or adults, should throw light on the more fundamental mental processes. In addition, the rapid rate of maturation of all the processes of growth—mental, anatomical, and physiological—makes possible comparisons between successive stages of growth in the same children within a relatively short time interval.

What infant behavior may we call "mental"? What specific behavior precedes later mental achievements? To what extent are these later achievements dependent on the earlier? Can we predict later development from early behavior? How do individual growth rates compare with the norm for a group of infants? To what extent are these rates affected by environmental conditions? These are a few of the questions for which we may find some, at least partial, answers by means of repeated observations of the same infants under similar test conditions.

Infant intelligence tests have been devised and standardized on the assumption that maturation in sensorimotor functions and simple adaptations *are* intellectual and should be predictive of later intellectual performances. However, it does not necessarily follow that individuals whose sensory acuity is great and whose simple coordinations are perfected more rapidly will eventually be able to respond more adequately to complex situations. In adults, simple sensory tests have only very low correlations with intelligence. It may well be true that the relationship in infants is no greater, even though, developmentally, the simple forms of behavior appear first and are components of the more complex intellectual responses which develop later.

We must bear in mind the possibility that behavioral development during the first year may, within rather wide normal limits, give little indication of later intelligence. Intelligence may involve characteristically "higher" functions which have very little representation in the infant's repertory. It may be as difficult (outside of pathological deviations) to predict intelligence in infancy as it is to predict vocational aptitude or artistic genius in infancy.

The entire maturation process is so rapid during the early years that several distinct types of test situations occur during the first three-year period. Some of these differences may be found in the nature of the test items themselves; others are due to changing attitudes in the child as he grows up. The month-old baby lies on his back in a crib and is active or suddenly quiet in response to touches, sounds, and sights. At six months, he can be tested in a number of definitely "adaptive" activities; he is very responsive to social stimuli; he is just beginning to sit alone and can be tested while sitting propped up before a table.

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* For more detailed accounts of these investigations see other reports by the writer (3, 4, 5). Adapted with permission of *Genetic Psychology Monographs* and National Society for the Study of Education.

Shortly after this level is reached, a new element enters into the testing situation which causes great difficulties in children who are brought in only at intervals for a short examination; at this stage they become afraid of strange or unusual persons and places. Their movements, and especially their vocalizations, are inhibited to such an extent that adequate scores of their ability sometimes cannot be obtained. They gradually get over this, but from eighteen months on, for a year or more, they usually develop, in varying degrees, what has been called "negativism." At this stage a child may, as if on principle, refuse to do whatever is asked of him.

It is only after this phase is outgrown that one can achieve a test situation comparable to that which has usually been considered necessary in administering mental tests, *i.e.*, a desire on the part of the child to succeed in the task set for him, a directed effort to do his best, and full cooperation with the tester. Before this time, such effort can be secured only if the test itself elicits it; and no matter what the test, a child *may* not become interested, or, if he does, he may expend his effort in a direction which was not intended and so fail to indicate whether or not he could have scored. For example, a child may insist on building houses with the formboard blocks instead of fitting them in the forms; or he may start a game of throwing the cubes to the floor instead of attempting to build with them.

With these individual variations in attitude, one can hardly expect to get completely accurate scores of ability. However, repeated tests of the same children at short intervals should make possible fairly reliable estimates of their test abilities and of growth trends of the group. A comparison of the early with the later scores of these same children may indicate to what extent the tests at various levels are measuring the same or comparable things.

The present study (carried on at the Institute of Child Welfare of the University of California, Berkeley) has made such a comparison possible over the first three years of life—the period in which the most rapid growth occurs and hence the one in which the most radical variations might be expected if they are to be found at all.

In 1938 the 48 children who remained in the study had been tested over a period of 9 years, making possible a supplementary study of individual rates of mental growth well into the grammar-school ages. In a few instances the tables and text of the original monograph will be augmented with these additional findings for the same children.

Data Collection

Sample.—Although some attempt was made to secure a sample which would be representative of the white, English-speaking population of Berkeley, several limitations necessary to the purposes of the study caused the selection of a group in some respects atypical. Only babies born in hospitals were included;* the two hospitals from which they were recruited represent a fairly wide socioeconomic range, one of them, a county hospital, taking charity cases, the other drawing its patients from the middle and upper classes. From these two hospitals were enrolled normal, full-term infants whose mothers were cooperative and willing to make the necessary monthly visits to the institute.

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* Approximately 92 per cent of Berkeley children are born in hospitals.

The results obtained are based on the data from 61 infants, 31 males and 30 females. All these children came into the Institute of Child Welfare for at least six examinations. By the end of the first year, 4 had dropped out, leaving 57 still enrolled; by the end of the second year there were 53; and by the end of the third year 49 of the original 61 children were coming in for the tests. A few children missed one or more examinations owing to illness or visits out of town. In all, 1,142 tests were made in the 3-year period. Although the sample is not identical at every age level, it is very highly similar throughout, and any sampling selection may be considered practically constant at all ages. A cursory survey of the 12 cases which dropped gives no evidence of any selective factors in regard to family status which might have caused their withdrawal.

A comparison of the socioeconomic status of the families of these children with the sampling of 405 Berkeley families obtained in the Berkeley Survey of the Institute of Child Welfare (18) has served to show in what ways the group under present consideration is representative. This comparison has shown that certain characteristics of the family background and environment are distributed in the same way for the children of the Berkeley Growth Study (as the present investigation has been called) as for the population of all young children in Berkeley. These characteristics are: sex of the infant being studied in the survey, sex of its siblings, number and age of the siblings, length of time the family has lived in Berkeley, age of parents at the time the survey infants were born, place of marriage, and age at marriage. There are, on the other hand, three characteristics in which the Growth Study group is, on the average, definitely superior; these are parents' education, occupation, and income. These three measures in which this group differs from the Berkeley population probably represent the same selective factors. They indicate that the parents who are sufficiently interested to enter into a study such as this are more likely to be above the average in socioeconomic ratings. And it is clear that, as a group, the infants we are studying have a superior socioeconomic background to that which would be found in an unselected population. However, there is a fairly wide range in all three of the characteristics in which the Growth Study shows a selective difference from the Berkeley population and no class is entirely unrepresented.

The Experimental Situation.—The infants were first observed in the hospital within 3 days after birth.* At this time an appointment was made with the mother for the first visit to the institute, one month from the date of birth. Age was reckoned by the usual solar month, and, since emphasis in this study was placed on the growth of the *same* children, in order to have as few absences as possible, a leeway of 4 days before or after the birthday was allowed.† Every effort was made, however, to keep the visit on the birth date, so that the wider variations were comparatively rare.

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* The hospital observations and interviews were made by Dr. Lotta V. Wolff.

† Correlation charts, plotting the raw score on the tests against age in days, indicated a very slight advantage for the older children at one month, but none at two or three months. Since the one-month tests were found to be comparatively unreliable, and since it was impossible accurately to determine conceptual age, no correction for age variations was made.

The observation period usually lasted about 50 min. with the very young infants, the time gradually increasing with age, until at thirty-six months the entire set of observations usually required 2 hr. In the early ages the mental tests took up a very small part of the period, but later their length increased, until at the thirty- and thirty-six-month tests they required between 30 and 45 min. It was found necessary to adapt the time of examination to the mother's and the infant's schedule. Insofar as possible each baby was brought at a time when it was usually awake and playing and at the same time of day each month.

But these precautions do not ensure, with young infants, a regular and exact procedure of testing. In the early months responses to a given stimulus depend to a large extent on the child's mood and degree of wakefulness. Because of this variability, scores cannot be confined to tests applied in a definite serial order, but the order itself must depend on the child, and he may be expected to manifest a given ability at any time during the observation period, even though he failed to do so when a specific opportunity was offered him.

Another variable factor is the role played by the examiner. The importance of the examiner in the testing situation was found to change with the age of the child. During the first 2 months this factor was relatively slight. Soon, however, the children developed an interest in faces and a tendency to fixate large moving forms. For these reasons, during the tests given in the crib (except when her presence was a part of the test situation), the examiner stood at the end of the crib back of the child's head. In this position she was not in his range of vision and did not distract his regard from the presented test object. A little later, a friendly social attitude made the child happy and responsive, until he developed a fear or dislike of the unusual and of persons he did not know. During this period (which in some cases began as early as seven months and in others lasted as late as twenty-four months), with children who showed this reaction, the examiner effaced herself from the situation as much as possible, remaining quiet much of the time, keeping the child's attention on the toys instead. Only after the child had again become socially cooperative did the examiner find advantageous the personal "rapport" advised in the usual test procedures.

The infants were tested while lying in the crib in the early months. Then starting with test item 25 (Table 1), some of the tests were given with the child seated at the table in the mother's lap. After about six months of age, all the tests were given with the child sitting at the table, and when he was able he sat alone in a high chair. A period of adjustment to the strange place was often necessary; but if a shy or distressed child was seated at the testing table with toys in front of him and his mother close beside him, he usually became interested in the toys and started to play. When the child had become accustomed to the situation and had forgotten his inhibitions in play, the test materials were substituted for the preliminary toys.

The Test Items.—The test items used in this study were selected on the basis of their probable validity in indicating "mental" development. Gross bodily coordination and motor tests have been excluded from the series and will be treated in a study of motor development. The mental series includes tests of adaptability or learning and tests of sensory acuity and fine motor (manual) coordinations. The latter are included in the mental series because they seem related to the manual tests (such as the pegboards and formboards and block building) which occur in most preschool mental tests. The first-year items have been

TABLE 1.—MENTAL DEVELOPMENT TEST ITEMS
(Listed in order of difficulty)

Item no.	Name of test	Absolute scale score	C.A. placement	*A-B* halves	*C-D* groups	*C′* items
1	Postural adjustment when lifted	0.05	0.5	*A*	*C*	*C′*
2	Lateral head movements, prone	0.06	0.6	*B*	*C*	
3	Momentary regard of ring	0.06	0.6	*A*	*C*	
4	Responds to sound	0.06	0.6	*B*	*C*	*C′*
5	Prolonged regard of ring	0.12	1.2	*B*	*C*	
6	Horizontal eye coordination	0.12	1.2	*A*	*C*	*C′*
7	Responds to voice	0.14	1.3	*A*	*C*	*C′*
8	Arm and leg thrusts in play	0.14	1.3	*A*	*C*	*C′*
9	Vertical eye coordination	0.16	1.4	*B*	*C*	
10	Circular eye coordination	0.17	1.45	*B*	*C*	*C′*
11	Social smile	0.17	1.45	*A*	*D*	
12	Vocalizations	0.18	1.55	*B*	*C*	*C′*
13	Turns eyes to light	0.24	1.9	*B*	*C*	*C′*
14	Free inspection	0.30	2.2	*A*	*C*	*C′*
15	Eyes follow pencil	0.32	2.3	*A*	*C*	*C′*
16	Anticipatory excitement	0.33	2.4	*B*	*D*	
17	Manipulates ring	0.43	2.9	*A*	*C*	*C′*
18	Reaches for ring	0.46	3.0	*B*	*D*	
19	Blinks at shadow	0.47*	3.1	*B*	*D*	
20	Vocalizes to social stimulus	0.47*	3.1	*B*	*C*	*C′*
21	Fingers hand in play	0.49*	3.2	*B*	*C*	*C′*
22	Reacts to paper on face	0.49	3.2	*B*	*C*	
23	Carries ring to mouth	0.52	3.3	*A*	*C*	
24	Aware of strange situation	0.52*	3.3	*A*	*D*	
25	Follows vanishing object	0.53	3.35	*A*	*C*	*C′*
26	Anticipatory adjustment to lifting	0.54	3.4	*A*	*D*	
27	Regards cube	0.55	3.45	*B*	*C*	*C′*
28	Plays with rattle	0.57	3.5	*A*	*C*	*C′*
29	Manipulates table edge	0.61†	3.6	*A*	*C*	*C′*
30	Inspects hand	0.62	3.65	*B*	*C*	*C′*
31	Closes on dangling ring	0.70*	3.95	*A*	*D*	
32	Turns to sound	0.72	4.0	*B*	*D*	
33	Beginning thumb opposition	0.74	4.1	*B*	*C*	*C′*
34	Active table manipulation	0.84†	4.4	*B*	*C*	*C′*
35	Reaches for cube	0.88	4.5	*A*	*D*	
36	Eye cooperation in reaching	1.00*	4.8	*A*	*C*	*C′*
37	Partial thumb opposition	1.10	5.1	*A*	*C*	*C′*
38	Picks up cube	1.12	5.2	*A*	*C*	*C′*
39	Retains two cubes	1.16	5.3	*B*	*C*	*C′*
40	Regards pellet	1.18†	5.35	*B*	*C*	*C′*
41	Recovers rattle	1.18*	5.35	*B*	*C*	
42	Discriminates strangers	1.25†	5.55	*B*	*D*	
43	Vocalizes eagerness	1.30	5.6	*B*	*C*	*C′*
44	Simultaneous flexion and thumb opposition	1.34	5.75	*A*	*C*	*C′*
45	Lifts cup	1.35†	5.8	*A*	*C*	
46	Paper play	1.35	5.8	*A*	*C*	*C′*
47	Accepts second cube	1.37	5.85	*A*	*C*	
48	Vocalizes pleasure	1.38	5.9	*B*	*C*	
49	Vocalizes displeasure	1.39*	5.95	*A*	*C*	
50	Reaches persistently	1.46	6.05	*B*	*D*	
51	Turns after spoon	1.47	6.1	*A*	*D*	
52	Mirror image approach	1.47*	6.1	*B*	*C*	

TABLE 1.—MENTAL DEVELOPMENT TEST ITEMS.—(*Continued*)

Item no.	Name of test	Absolute scale score	C.A. placement	*A-B* halves	*C-D* groups	*C'* items
53	Picks cube deftly	1.52†	6.2	*A*	*C*	*C'*
54	Several syllables	1.54	6.3	*A*	*C*	
55	Bangs in play	1.57	6.35	*A*	*C*	
56	Sustained inspection of ring	1.59	6.4	*B*	*D*	
57	Unilateral reaching	1.61	6.45	*A*	*C*	*C'*
58	Vocalizes satisfaction	1.62	6.5	*B*	*C*	*C'*
59	Lifts cup by handle	1.65	6.6	*B*	*C*	*C'*
60	Exploitive string play	1.72	6.7	*A*	*D*	
61	Rotates wrist	1.75	6.7	*B*	*C*	*C'*
62	Scoops pellet	1.84	6.8	*B*	*C*	*C'*
63	Smiles at image	1.95*	7.2	*A*	*C*	*C'*
64	Interest in bell details	1.95	7.2	*B*	*D*	
65	Looks for spoon	1.96	7.25	*A*	*D*	
66	Frolic play	1.97	7.3	*B*	*D*	
67	Pulls string: secures ring	1.98†	7.35	*A*	*D*	
68	Vocal recognition	2.00*	7.4	*A*	*D*	
69	Sound production, interest	2.09*	7.6	*A*	*D*	*C'*
70	Complete thumb opposition	2.10†	7.65	*B*	*C*	*C'*
71	Partial finger prehension	2.22	7.8	*A*	*C*	*C'*
72	Retains two of three cubes	2.30†	8.0	*B*	*D*	*C'*
73	Vocalizes interjections	2.35	8.1	*B*	*C*	*C'*
74	Attends scribbling	2.35†	8.1	*B*	*D*	
75	Cooperates in games	2.49	8.45	*A*	*D*	
76	Exploits formboard and block	2.51	8.5	*A*	*D*	
77	Listens to familiar words	2.51	8.5	*A*	*D*	
78	Says "da-da" or equivalent	2.55	8.55	*B*	*C*	*C'*
79	Explores formboard holes	2.57	8.6	*B*	*C*	*C'*
80	Attempt to secure three cubes	2.61	8.7	*A*	*D*	*C'*
81	Interest in throwing	2.69*	8.9	*B*	*D*	*C'*
82	Fine prehension	2.90	9.3	*B*	*C*	*C'*
83	Pulls string adaptively	2.97†	9.5	*B*	*D*	
84	Uses handle: secures cube	2.99	9.6	*A*	*D*	
85	Play to mirror	3.07*	9.7	*B*	*D*	
86	Differentiates words	3.13	9.8	*A*	*D*	
87	Rings bell purposively	3.16	9.9	*B*	*D*	
88	Puts cube in cup	3.41†	10.4	*A*	*D*	
89	Scribble imitation attempt	3.42†	10.4	*B*	*D*	
90	Unwraps cube	3.59	10.6	*A*	*D*	
91	Holds crayon adaptively	3.75†	11.2	*A*	*D*	
92	Inhibits on command	3.86	11.5	*B*	*D*	
93	Repeats: laughed at	3.89†	11.6	*A*	*D*	
94	Strikes doll imitatively	3.89	11.6	*B*	*D*	
95	Imitates words	3.92*	11.7	*B*	*D*	
96	Spoon imitation	4.11	12.1	*B*	*D*	
97	Holds cup to drink	4.12*	12.2	*B*	*D*	
98	Adjusts round block	4.29	12.6	*A*	*D*	
99	Says two words	4.44*	12.9	*A*	*D*	
100	Dangles ring by string	4.49	13.1	*A*	*D*	
101	Spontaneous scribble	4.51	13.2	*B*	*D*	
102	Expressive jargon	4.66	13.5	*B*	*D*	
103	Tower of 2 cubes	4.66	13.5	*B*	*D*	
104	Places 1 peg repeatedly	4.73†	13.7	*A*	*D*	
105	One block in Bayley board	5.20	15.1	*B*	*D*	
106	Round block in Gesell board, reversed	5.24	15.2	*A*	*D*	

TABLE 1.—MENTAL DEVELOPMENT TEST ITEMS.—(*Continued*)

Item no.	Name of test	Absolute scale score	C.A. placement	*A-B* halves	*C-D* groups	*C′* items
107	Looks at pictures	5.34†	15.5	*A*	*D*	
108	Throws a ball	5.43†	15.8	*B*	*C*	
109	Tower of 3 cubes	5.60	16.3	*B*	*D*	
110	Turns pages	5.66	16.6	*A*		
111	Square or triangle in Gesell board	5.72	16.8	*B*		
112	Places pegs in 70 seconds	5.85†	17.2	*A*		
113	Two round blocks in Bayley board	5.86†	17.2	*B*		
114	Names 1 object	5.92*	17.4	*A*		
115	Puts cover on box	5.93	17.5	*A*		
116	Places pegs in 42 seconds	5.94	17.5	*A*		
117	Mends broken doll	6.05	17.7	*B*		
118	Imitates a stroke	6.05*	17.8	*A*		
119	Finds one object	6.16†	18.1	*A*		
120	Places pegs in 38 seconds	6.18	18.2	*A*		
121	Names 1 picture	6.32	18.7	*B*		
122	Differentiates scribble and stroke	6.36*	18.9	*B*		
123	Names Gesell watch, 5th picture	6.52	19.4	*A*		
124	Names 2 objects	6.56	19.6	*B*		
125	Names Gesell watch, 4th picture	6.56	19.6	*B*		
126	Discriminates cup and plate	6.65	19.8	*B*		
127	Turns doorknob	6.72	20.0	*B*		
128	Square or triangle in Gesell board reversed	6.75	20.1	*B*		
129	Bayley board, also 2 squares	6.80	20.2	*A*		
130	Finds 2 objects	6.83	20.4	*B*		
131	All 3 blocks in reversed board	6.91	20.6	*B*		
132	Points to 3 pictures	6.93†	20.7	*A*		
133	Places pegs in 30 seconds	7.00	21.0	*B*		
134	Discriminates cup, plate, box	7.06†	21.1	*A*		
135	Names 3 pictures	7.08*	21.2	*B*		
136	Builds tower of 6 cubes	7.10	21.3	*B*		
137	Names 3 objects	7.18	21.5	*A*		
138	Differentiates tower and pyramid	7.30*	22.0	*A*		
139	Completes Bayley board in 150 seconds	7.59	22.8	*A*		
140	Points to 5 pictures	7.67	23.1	*B*		
141	Bayley board in 90 seconds	8.03	24.3	*A*		
142	Names 5 pictures	8.05	24.4	*B*		
143	Names Gesell watch, second picture	8.07*	24.5	*A*		
144	Imitates strokes, vertical and horizontal	8.21	24.9	*B*		
145	Understands 2 prepositions	8.23	25.0	*A*		
146	Points to 7 pictures	8.28†	25.1	*A*		
147	Builds tower of 8 cubes	8.36†	25.3	*A*		
148	Selects "big" object	8.38	25.4	*B*		
149	Memory: 1 object	8.72	26.5	*A*		
150	Bayley board in 60 seconds	8.75*	26.6	*A*		
151	Places pegs in 22 seconds	9.00	27.4	*A*		
152	Four-form card, 2 correct	9.01	27.5	*B*		
153	Understands 3 prepositions	9.18	28.0	*A*		
154	Form card, 1 correct	9.18	28.0	*B*		
155	Builds 3-cube pyramid	9.20	28.1	*B*		

TABLE 1.—MENTAL DEVELOPMENT TEST ITEMS.—(*Continued*)

Item no.	Name of test	Absolute scale score	C.A. placement	*A-B* halves	*C-D* groups	*C′* items
156	Points to "tiny" square	9.29	28.3	*A*		
157	Picture completions, 1 correct	9.32†	28.4	*B*		
158	Form completions, 1 correct	9.77	29.8	*A*		
159	Imitates + second trial	9.82†	29.9	*B*		
160	Memory: 2 objects	9.82	29.9	*A*		
161	Bayley board in 45 seconds	9.87	30.1	*B*		
162	Picture completions, 2	9.96	30.4	*B*		
163	Four-form card, 4	9.99	30.6	*B*		
164	Buttons 1 button	10.18	31.1	*B*		
165	Form card, 2	10.29	31.5	*B*		
166	Action agent, 2	10.42	31.9	*A*		
167	Picture description: adjective or verb	10.46	32.0	*A*		
168	Imitates + first trial	10.61	32.4	*B*		
169	Names 7 pictures (composite)	10.76†	32.9	*A*		
170	Form completions, 2	10.83	33.1	*A*		
171	Action agent, 5	10.85	33.3	*B*		
172	Form card, 4	10.97	33.6	*A*		
173	Builds pink tower in 75 seconds	11.00	33.8	*B*		
174	Knows 5 prepositions	11.08	33.9	*B*		
175	Pink tower in 40 seconds	11.13	34.1	*A*		
176	Pink tower in 28 seconds	11.25	34.5	*B*		
177	Copies 1 circle, 3 trials	11.28	34.6	*A*		
178	Discriminates long line	11.29	34.7	*B*		
179	Action agent, 9	11.41	34.9	*A*		
180	Form card, 7	11.43	35.1	*A*		
181	Remembers 1 of 4 pictures	11.61	35.6	*A*		
182	2 buttons in 75 seconds	11.92	36.6	*A*		
183	Action agent, 12	12.05	37.0	*B*		
184	Form completions, 4	12.15	37.3	*B*		
185	Picture discrimination, uses preposition or pronoun	12.33	37.8	*B*		

Additional Tests, Passed by One or More Children, for Which No Difficulty Placements Were Made

Name of test	*A-B* half	Name of test	*A-B* half
Six-cube pyramid	*A*	Copies gate	*B*
Copies 3 of 3 circles	*B*	Copies 1 of 3 triangles	*A*
Form card, 9	*A*	Form recognition, 1	*B*
Form recognition, 2	*B*	Form recognition, 3	*A*
Form recognition, 5	*B*	Prepositions on picture, 4	*B*
Prepositions on picture, 6	*B*	Right and left	*A*
Pink tower 19 seconds	*A*	Pink tower 14 seconds	*B*
Differentiates 2 and 3	*A*	Differentiates 3 and 4	*B*
Differentiates 4 and 5	*A*	Action agent, 14	*B*
Action agent, 16	*B*	Opposites, 1	*A*
Opposites, 2	*B*	Pictures, past or plural	*A*
Pictures, interpretation	*A*	Definitions, 1	*A*
Definitions, 2	*B*	Definitions, 3	*B*
Definitions, 4	*A*	Memory, 6	*B*
Form completions, 7	*A*	Picture completions, 3	*B*

* Items marked * by absolute scale score show increasing difficulty with age.
Items marked † show decreasing difficulty with age.
Columns (3) to (7) are explained in the text.

assembled from a number of sources, among them the tests of Kuhlmann (12), Gesell (7, 8), Jones (11), Lippmann (13), Cunningham (6), and Goodenough, Foster, and Van Wagenen (9). The selection of tests used, and, in many cases, the method of procedure and scoring, have been adapted to meet the conditions and purposes of the entire developmental study (3). Of the above-mentioned tests, Gesell's, being the most complete, were drawn on most heavily. Beginning with the second year, the tests used were the California Pre-school Schedules I and II, which were arranged by Dr. Adele S. Jaffa (10). At six and seven years they were given the Stanford-Binet (16), and at eight and at nine years Form *L* of the new revision of the Stanford-Binet (17).

The items which have been retained for this study of mental development are given in Table 1 in the order of difficulty found for the 61 Growth Study infants. The method of securing this difficulty order will be discussed later. In addition to the list of test items, Table 1 includes their scale and age placements and the various groupings used in an analysis of the results.

Limits of Testing.—Each test was repeated at successive visits until the child passed it 2 months in succession, and the advanced tests were always given until a difficulty level was reached where no tests were passed. As a rule this did not unduly prolong the time of the tests with the infants under one year, because many of the test procedures are scored simultaneously at several difficulty levels.

Method of Scoring.—The total test score assigned to each child for each test is a cumulative point score based on his actual successes at that test period. The difficulty placements of the individual test items, on the other hand, are obtained from the first of two successive passes of those cases in which the child had been given, and failed, the item at the previous age level.*

Results

Reliability of the Tests.—Since it was not feasible, under the conditions of the testing program, to repeat an entire test within a short interval, the reliability of the tests was computed by the split-half method. For this purpose, items were paired on the basis of similarity in difficulty, in nature of the function tested, and in range of success. After the items were paired they were arranged into Groups *A* and *B*, with the groups as nearly as possible equal in the variety of performances tested and in difficulty at each month.

The reliability of the total test (using the Spearman-Brown correction) is for most months above .80.† The average is .82. In the first three months, however, it is low (.51 to .74); it is also low from twelve to fifteen months (.75 to .78). The highest values are reached between five and eight months (.91 to .95). Since the fluctuations in reliability seem to be influenced by factors other than chance, they call for a word of interpretation.

Although the items were selected with the hope that there would be an approximately equal number for each age level, their actual distribution in difficulty turned out to be uneven, with many more items near six months in difficulty than near twelve months. Such a distribution increases the reliability of the tests for the ages at which there are many items entering.

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* For example, a test which is passed at six months, failed at seven, passed at eight, and passed again at nine, is placed at eight months.

† These correlations could be corrected for variability differences, making all standard deviations approximately equal to the six-month standard deviations, or 5.0. But if this were done, the increase in the size of the standard deviations for the early months would be relatively so great that the correction does not seem justifiable.

into the total score and decreases it where the items are few.

Further differences in reliability may be inherent in the different maturity levels tested. In the neonate, behavior patterns are not yet firmly established and the responses to a stimulus are diffused and varied, making it impossible to obtain reliable measures of mental maturity through short-time observations. When these patterns become stabilized the reliability of the tests increases and stays high, up to a point where a greater diversity of response is possible and where another variable factor enters with the development of social attitudes. At the ages when the children are most likely to be disturbed by the unusualness of the place and testing situations, the test reliabilities fall. They gradually increase again as the children develop in social adaptability and become positively responsive to adult requests.

The correlations between total scores in tests given at adjacent months may also be considered indicative of reliability, especially between months seven and fifteen, where the monthly increment is small enough so that the two tests involve, for the most part, the same items, and a similar level of ability. These correlations follow the same trends as the split-half correlations; they indicate low reliabilities during the first four months and fairly high ones thereafter, especially at six and seven months. If we select those successive tests which are sufficiently similar to be considered as retests, *i.e.*, the eight combinations from months seven to eighteen, inclusive, we find that the correlations range from .73 to .87, with an average of .80. The correlations of consecutive tests for the whole series, from month five through month thirty-six, range from .71 to .89, and average .82.

Both the foregoing sets of correlations show that the tests, after month three, with the possible exception of months twelve, thirteen, and fourteen, are as reliable as most preschool and infant tests of intelligence.

It seems possible then, after month three, to draw conclusions in regard to growth trends with a fair amount of confidence in the reliability of the testing instrument. This is especially true if the average score on two or three tests is taken as a measure of the child's performance.

Growth Trends.—A growth curve plotted from the means of the raw cumulative point scores is shown in Fig. 1. For each mean, the standard deviation is represented.

Since there is an unequal distribution of the test items in difficulty, this curve is of significance mainly in showing, especially in the first year, the rapid change in scores and the importance of chronological age (C.A.) in determining a child's score. When the standard deviation is taken into consideration it is found that the overlapping of scores at consecutive months is very slight. Throughout the first year, where the correlation between C.A. and score is .981, the mean plus one standard deviation for any month is lower than the mean for the next test above. From fifteen months on, when the testing intervals have increased to 3 months, this same condition holds, through twenty-seven months. After this, the standard deviation increases in proportion more rapidly than the mean score, and with the increasing overlap in scores of consecutive tests the C.A. differences in test ability diminish, though they are still obvious.

Another way of showing this rapid growth in the group is to state the percentage of overlapping in scores at different ages. For the first five months there is no case in which a score overlaps the median of the month above. After this, there is a slight overlapping, which tends to increase with increasing age. But if tests separated by 2 months are compared, no score overlaps the median of the scores 2 months above, during the first thirteen months. Making the same comparisons for 3-month intervals, no score exceeds the median of the higher test until fifteen months. The trend is toward an increasing amount of overlapping of scores with increasing age. During the first six months the overlapping between scores only 1 month apart is less than between the entire 6-month intervals from twenty-four to thirty and from thirty to thirty-six months. On the other hand, in comparison with school-age tests, where scores of ten-year-olds, for example, may range from seven and one-half to thirteen years in mental age, the marked importance of C.A. is still evident through thirty-six months.

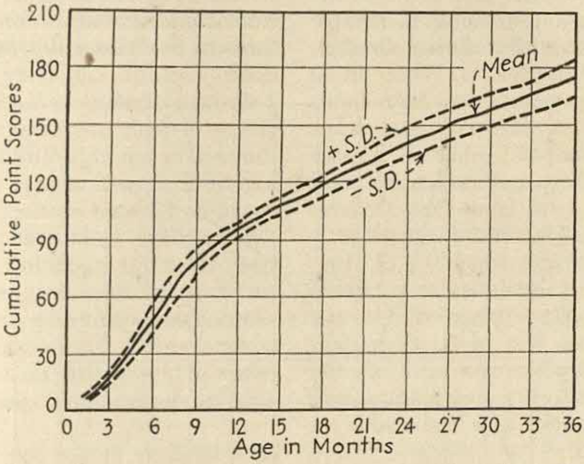

FIG. 1.—Mental-growth curve—cumulative-point scores. (*From Genet. Psychol Monogr.*, 1933, **14** *No.* 1, *p.* 39.)

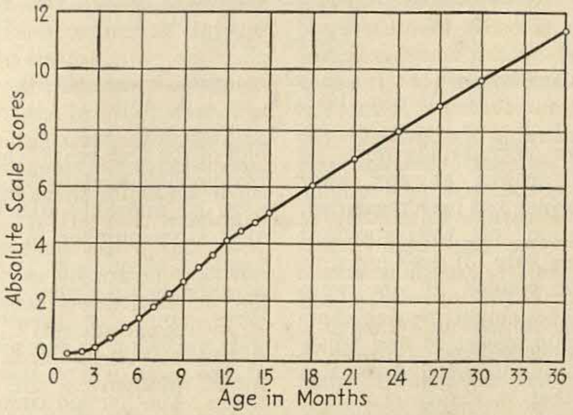

FIG. 2.—Mental-growth curve—Thurstone absolute scale. (*From Genet. Psychol. Monogr.*, 1933, **14**, *No.* 1, *p.* 43.)

As for the actual form of the curve of mental growth, Thurstone has plotted an absolute scale curve based on our data for the first twenty-four months (Fig. 2). The curve shows positive acceleration during the first seven or eight months; then a very slight negative acceleration during the rest of the first year is followed by a comparatively constant rate after fifteen months. An extension of this curve by the same method, for data through thirty-six months, indicates that this constant growth rate continues up to this age.* Whatever growth changes are being measured here, it is obvious that during the first year they are very rapid—more so than mental growth at any later period of life which has been measured.

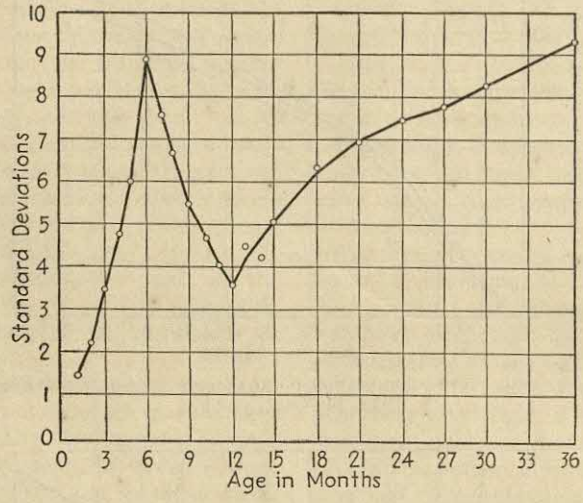

FIG. 3.—Standard-deviation curve—cumulative-point scores. (*From Genet. Psychol. Monogr.*, 1933, **14**, *No.* 1, *p.* 44.)

An inspection of the standard deviation curve (Fig. 3) does not give such clear-cut results. If one were measuring some single mental character, one would expect to find (since the sample of children tested remains constant) either a fairly constant standard deviation or one showing a consistent directional change. But, in the present test series, the standard deviations of the cumulative point scores increase steeply from one to six months, then with a sharp break make an equally steep decrease to twelve months. After this a gradual increase continues throughout the second and third years.†

What is the reason for the sudden check and decline in the increasing standard deviations during the second half of the first year? There seem to be two possible explanations. If the items were so unevenly distributed that a very large number of them clustered together at one age position while at another age they were very scarce, then there would be greater chance for wide variation in the raw point scores at the ages where there were many items. Another possible cause of the sudden change in variability of scores could be in the arbitrary joining together in the growth curve of different kinds of function, developing at rates independent of one another, but at adjoining C.A. periods; *i.e.*, if, for the first eight or ten months, the test items measure predominantly one kind of developing ability which reaches, toward the end of this time, approximate maturity, while the tests after eight or ten months become, rather abruptly, measures of another kind of developing ability which matures later, and probably started later—if this were so, then it would follow that as the early set of abilities reached the approximate limit of development (where the tests did not discriminate individual differences), the standard deviation must *decrease;* while a subsequent shift to measures of another type of ability would again change the trend of the standard deviations so that they would increase with increasing development in this new function.

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* When the curve was drawn on a larger, less selected sample, extending from twenty-one through ninety-six months, by Miss G. Cox, it was found to exhibit a fairly steady deceleration throughout that period.

† The curve of standard deviations derived by Thurstone's absolute scaling does not show this break so clearly, though there is evidence of a stationary S.D. between nine and twelve months, instead of the continuous increase found earlier.

A study of the nature and distribution of the test items, which will be considered in a later section, should indicate the extent to which these two factors have been operative in the present series of tests.

Consistency of Mental Ratings.—As we have seen in discussing the reliability of the tests, correlations between consecutive tests, even though there is a lapse of a month or more between tests, are for the most part high. They average .82.* But when alternate tests are compared, and the intervals between tests become, for the first year, 2 months instead of 1, and for the later tests, 6 months instead of 3, the correlations drop. They average only .70. This definite decrease in relationship for such short-time intervals raises the question of the consistency in the scores obtained in more widely separated tests.

For comparisons over wider age intervals, in order to rule out chance variations in a single test, the average of three consecutive tests was used as the score for a given age level. In order that each test should have equal weight in these comparisons, sigma (standard deviation) scores† were computed for every test (each child at each age), and the average of three consecutive sigma scores was used; *i.e.*, the average of the sigma scores for months one, two, and three was correlated with the average for months four, five, and six. Test scores were in this way grouped in three's through thirty-six months. The results are shown in Table 2 (page 100). This series of correlations, with remarkably consistent trend, shows that, though the children remain relatively stable in their scores over short periods, their position in the group is liable to great variation over longer age intervals. There is no significant relationship between a child's scores in the first three months and those he makes after nine months (the correlation with months ten, eleven, and twelve is .28); or between his average score in months seven, eight, and nine and his performance in the third year (the correlation is .22).

It is evident that the children's rates of mental growth become much more stable around four years of age. The

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* If these coefficients are corrected for attenuation on the basis of the split-half reliabilities, they average .95. However, the correlations between some of these adjacent tests may, in themselves, be considered as reliability coefficients.

† The essential characteristic of the sigma score of any individual, I, on test T, at age, A, may be stated as follows:

$$\text{Sigma score} = \frac{\text{score of } I \text{ on } T - \text{mean score of } S\text{'s of age } A}{\text{standard deviation of distribution of scores of } S\text{'s of age } A}$$

Because they state an individual's score relative to the group average and in terms of the group variability, sigma scores at different ages are directly comparable when the group is the same or equivalent.

r's of the four-year and later tests show no marked drop in relationship with later tests, but remain little changed over a period of several years. From these data it would appear that prediction in the grade school from tests given at four years of age may be possible within wide classifications for most of the children (*r* is about .75). Tests given between two and four years will predict eight- and nine-year performance with less success (*r* is about .55), while scores made before eighteen months are completely useless in the prediction of school-age abilities.

There are several possible explanations of this lack of consistency in the test scores. Each child may have, during the early period of rapid growth, an independent rate of mental development. These individual growth curves might differ in various ways: by one or more independent cycles of slow and rapid maturation; or by complete irregularity in growth rates.

It may be that intelligence is not measured in the early months. If so, one could argue that only as this general factor of intelligence becomes increasingly manifested in the test scores can the scores be considered to measure that factor, and only when it becomes predominant will the scores be consistent. Systematic changes in attitude toward the test situation may tend to lower the correlations between scores obtained at ages when the child's social responsiveness, interest in success, and so on, are very different. It does not seem possible, however, that such attitude changes can have a pronounced effect on the scores. It may be that the tests used in this study measure various things and not a single "intelligence" which can be tapped and evaluated at any convenient stage in a child's development. Rather than a single factor, there may be multiple factors, different ones entering into the score at different age levels. This seems very probable, especially as it is in accord with one explanation offered for the sudden break in directional trend of the standard deviation curve. Since we do not know exactly what intelligence is, we cannot, in the face of this evidence, very well make assumptions about the

TABLE 2.—CORRELATIONS BETWEEN AVERAGE MENTAL SIGMA SCORES

Months	Months							
	4, 5, and 6	7, 8, and 9	10, 11, and 12	13, 14, and 15	18, 21, and 24	27, 30, and 36	42, 48, and 54	60, 72, and 84
1, 2, and 3	.57	.42	.28	.10	−.04	−.09	−.21	−.13
4, 5, and 6	—	.72	.52	.50	.23	.10	−.16	−.07
7, 8, and 9	—	—	.81	.67	.39	.22	.02	.02
10, 11, and 12	—	—	—	.81	.60	.45	.27	.20
13, 14, and 15	—	—	—	—	.70	.54	.35	.30
18, 21, and 24	—	—	—	—	—	.80	.49	.50
27, 30, and 36	—	—	—	—	—	—	.72	.70
42, 48, and 54	—	—	—	—	—	—	—	.82

gradual appearance of *g* or its independent growth cycles without first examining the nature of the tests on which these scores are based.

Analysis of the Test Items. *Order of Difficulty.*—The first step in the study of the individual test items was to arrange them in order of difficulty. This was done on the basis of the percentage passing each item at each age. Under the direction of L. L. Thurstone, placements on an absolute scale of difficulty were obtained for each item.

The scale value for each item is given in Table 1. On the basis of these scale placements, the items have been arranged in order of difficulty.

The test items are unevenly distributed in difficulty, a close clustering being found at the lower end of the scale, while at other places there are comparatively wide gaps. This is shown both by the absolute scale placements and the chronological age placements (Table 1).

Classifications of the Test Items.—The growth trends of the entire series of tests appear, a priori, to be the resultant of a number of underlying factors. It seemed possible to discover, or at least throw some light on, what these various factors are and what independent tendencies they manifest by dividing the test items into subclasses.*

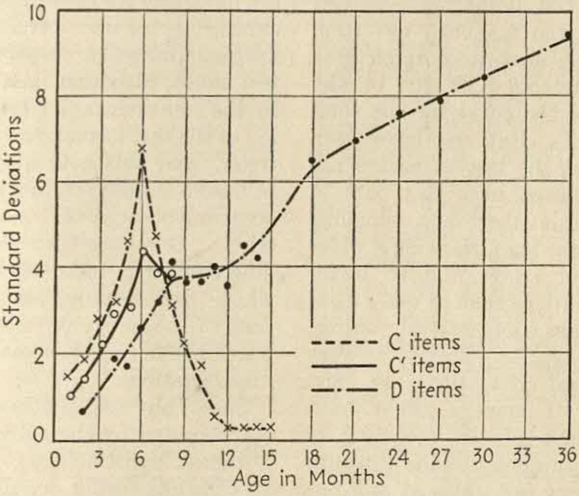

FIG. 4.—Standard-deviation curves for the sensorimotor (*C*) and adaptive items (*D*) separately; and for a selection of sensorimotor items equally distributed in difficulty (*C′*). (*From Genet. Psychol. Monogr.*, 1933, **14**, *No.* 1, *p.* 59.)

The early tests were predominantly sensorimotor in nature, while items which could be classed as adaptive, or "mental," were not to be found until later. In view of the break indicated by the standard deviation curve (Fig. 3), it seemed possible that a division between these two types of performance might result in two distinct but overlapping curves which would correspond to the break indicated in the curve for the total test items. All items concerned with sensorimotor and vocal (nonverbal) behavior were grouped together, while the rest of the items, which seemed to be more truly adaptive, were put in another group. These we will call Groups *C* and *D* respectively (Table 1). It was found that the *C* items dwindled and practically disappeared at about nine months, while the *D* items, which enter later than the *C* tests, are comparatively few and scattered at first and then become predominant as the *C* items drop out.

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* Several classifications were tried, but only the most fruitful of these will be discussed in this reduced version of the study.

When the test items are classified in this way, the standard deviation curve of the *C* (sensorimotor) group is found to correspond closely to the earlier part of the curve for the total items (Fig. 4). But we have seen (Table 1) that the test items are not evenly distributed over this part of the growth scale; there is a bunching of items at some ages, allowing a wider distribution of scores and so larger standard deviations than at other ages, where items are comparatively scarce. This tendency for relatively very large standard deviations at and adjacent to six months might have been the result of the crowding of items around this point on the difficulty scale, with very few items at any one month after month nine (Table 1). It is after the age where the great number of six-month items could affect the scores that the standard deviations become very small again.

In order to determine whether this standard deviation trend is due entirely to the unequal distribution of the items, 55 items were selected from the *C* group (we may call this new selection *C′*). These items were selected so that there were five items from each month and they were placed, within the month, at fairly regular intervals on the difficulty scale. With an equal number of items at each age and a normal frequency distribution of scores, there would be no reason to expect a consistent directional change in the standard deviation curve until the age at which the children began to reach the upper limits of difficulty. In this group the standard deviations still show a consistent decrease after six months—exactly the same directional tendency which was found in the total and in the *C* group (Fig. 4). The standard deviations for the *C′* group have not been computed beyond eight months, because after this age the difficulty limits of the tests would automatically make them grow smaller.

This change in direction of the standard deviation curve cannot, then, be an extraneous effect deriving from the unequal difficulty distribution of the test items, although it is accentuated by the coincidence between the bunching of the test items and the functional trend. And this coincidence may not be due to chance but in itself may have occurred because of the relative scarcity, at this stage in development, of differentiating tests of the function which has already matured and of tests of the newly developing function which has not yet become diverse in its manifestations.

Such an explanation is further corroborated by the evidence from the *D* items. A distribution of these items in difficulty order by 1-month units shows that they are fairly even except for a section (5.6 to 7.1) corresponding to the ages between sixteen and twenty-one months, where an unusually large number is found.

The standard deviation curve oı the cumulative point score of the adaptive (*D*) group of items is in the later months identical with the total curve. But the elimination of the sensorimotor (*C*) items does not, as had been expected, leave it with a smooth, continuous increase. There is a plateau between eight and twelve months, and this has occurred in spite of the fact that the *D*-group items are quite evenly distributed in difficulty. But it is probably impossible to separate the two types of developmental process in the items in this overlapping period, since many of them include both kinds of function. Where there seemed any evidence of adaptive behavior a test was put in the *D* group, as adaptive items were scarce at the early ages. Such a failure really to exclude sensorimotor elements would account for the plateau of standard deviations in the *D* group and also for a more rapid increase in the standard deviations during the first half-year than would be expected from the trend at later ages. If one could segregate these functions into separate responses, the irregularity in the standard deviation curve of the adaptive tests from eight to twelve months might smooth out. However, it may be that maturation in the first half-year is almost exclusively confined to motor and sensory functions, which are unrelated to later development,* except for their priority in the growth series. If this is true, then the mental growth curve presented here, during the first year at least, is a composite; and it would be more correct to say that the curve in the first six or eight months is of sensorimotor development rather than of "intelligence."

The only item classification, of the various ones tried, which showed any real distinction between the classes was the division into sensorimotor and other (predominantly adaptive) behaviors. These two groups are successive in their appearance, rather than simultaneous, and are coincident with the directional changes in the standard deviation curve obtained for the total scores.

Conditions Which May Affect the Scores.—In the foregoing treatment the test scores have been considered independently of other factors. But there are some environmental conditions which affect or are related to a child's test scores, and these should be considered in interpreting the obtained results. Of such conditions we have some data on (*a*) parental ability as measured by education, (*b*) emotional behavior observed under test conditions during the first year, and (*c*) the effect of the play school as a favorable influence.

Education of Parents.—Mid-parent education scores of mothers' and fathers' schooling were correlated with the infants' scores for each age separately. The correlations at months one and two are practically zero. They are the least reliable tests and the tests which might have been affected by varying conditions of birth. Starting with month three and continuing through month seven, the correlation coefficients are consistently negative, varying around −.22; then from eight to fifteen months, they drop back to zero; after this they become increasingly positive until twenty-four months, and subsequently maintain a level between .41 and .50. These later correlations approach very close to the relationship usually found between parents and school-age children on intelligence tests.

The shift in relationship with age could be interpreted as an indication of environmental influence on development. If the correlations are considered to be zero at first, and then increase as the children have time to be influenced by their environment, then this explanation would be a reasonable though not a conclusive one. It seems more probable, however, when the changing nature of the infant tests is considered, that different abilities are being measured at different ages, and that later tests are better measures of the abilities which differentiate school achievement. The tendency for the early scores to be negatively correlated with parental education may, if significant, be due to innate differences in developmental rates, with the children who will later achieve higher scores having a slower initial development. Because the nature of infant tests is so radically different from later tests, it is impossible to determine from correlations with parental status whether or not the parent-child relationships are due to environmental influence.

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* Shirley (14, Chap. IX) found very little relationship between the locomotor and intellectual achievements (Minnesota preschool test at eighteen months) of 17 babies studied during the first two years.

Emotional Behavior.—The emotionality of the child as evidenced in his tendency to cry is not significantly related to his mental-test score (1). When the amount of crying which occurred during the examination period is stated in terms of the length of time a child cried relative to the time of the total period, the correlation between the percentage of crying and the test scores for the entire year is −.098 and is similarly low for the separate months during the year. A later study (5) has shown that emotional factors and attitudes do effect the test scores somewhat, but they are not related to consistent directional changes in test scores which continue over periods of several years.

Influence of the Play School.—Sixteen of the Berkeley Growth Study children attended, for varying periods, the institute play school. The sessions here last for 3 hours, from 9 A.M. to 12. The mean sigma scores of these children for the average of the two tests before they entered the school is .08; and for the average of the one, two, or three tests given after the children had been in school for at least 4 months the mean sigma score is .40. This is an increase of .32 sigma. The standard error of the difference, taking into consideration the correlation of .66 between the two sets of scores, has been computed. The obtained critical ratio of 2.0 shows that the chances are 98 in 100 that the difference is significantly greater than zero. This increase of the play-school group, which averages .32 sigma, is approximately equivalent to 4 I.Q. points.

Later test scores of this group of children, compared with a carefully selected control group, showed this gain to be only temporary. By school age the play-school group made scores practically identical with those made by the control group.

Of the conditions considered here, the one which shows the greatest apparent effect on the children's scores is the education of the parents. Since there is so little consistency between earlier and later scores on the mental tests, it may be argued that the parent-child relationship cannot be measured until the third year, when the behavior tested becomes similar to that measured by the parents' educational level. It is possible, then, to look to change in test function as one of the causes of the increasing correlation between parents and children.

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CHAPTER VII

LANGUAGE DEVELOPMENT OF THE PRESCHOOL CHILD*

DOROTHEA MCCARTHY

Introduction

This investigation was undertaken in an effort to arrive at a more complete description of how young children learn to speak than had heretofore been available. The acquisition of oral language, which has an amazingly rapid development during the preschool period, is perhaps the most important single aspect of the child's mental development, for he thereby acquires the basic tools of his later thought processes, as well as the abilities to acquire knowledge through understanding the speech of others and to communicate his ideas to those about him.

Most of the earlier studies have been done on one or two precocious children and are subject to the bias of parents' reports. For the most part they have been mere vocabulary counts, which have been recorded with such a variety of methods that comparisons of the results have been impossible. Only a few isolated studies have been concerned with analysis of sentence formation, usually of samples of all-day conversations of superior children. Smith (5) devised a vocabulary test and made an attempt to analyze 1-hr. conversations of nursery-school children, but the groups were far from representative of the population and were not discrete with regard to age and the amount of the sample of conversation varied tremendously from child to child.

The present investigation is an attempt to add to our knowledge of the development of the language of the child, as it is found in samples of the running conversation of a large number of children selected so as to give a random sampling of the population. The function of language in the child's life, the changes in the length of sentences, the complexity of sentence structure, and the proportions of the various parts of speech that occur in the material are the chief aspects of the problem attacked.

Collection of Data

Subjects. *Age.*—On the basis of several indications in the literature, children between the ages of eighteen and fifty-four months were included in the study. While the average child speaks a few words before eighteen months, it is not until approximately this age that word combinations begin to appear even in the most advanced children. By fifty-four months the period of most rapid linguistic development is usually over, and while the child's speech has not reached the degree of perfection found in the adult, his speech is so fluent that an accurate record of it over any extended period

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* This summary of the original monograph (3) is published with permission of the University of Minnesota Press.

TABLE 1.—DISTRIBUTION OF CASES BY AGE, SEX, AND PATERNAL OCCUPATION

Occupational group	Chronological age, months																							
	18			24			30			36			42			48			54			Total		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
I	1	—	1	—	1	1	—	1	1	1	—	1	—	1	1	1	—	1	1	—	1	4	3	7
II	—	2	2	—	1	1	1	—	1	1	—	1	1	1	2	—	1	1	—	1	1	3	6	9
III	2	5	7	3	4	7	4	3	7	2	5	7	4	3	7	3	5	8	3	4	7	21	29	50
IV	3	2	5	2	3	5	1	4	5	3	2	5	3	2	5	3	2	5	6	—	6	21	15	36
V	1	2	3	2	2	4	—	3	3	1	2	3	2	1	3	1	2	3	—	3	3	7	15	22
VI	2	—	2	1	1	2	2	1	3	2	1	3	2	—	2	1	1	2	1	1	2	11	5	16
Total.....	9	11	20	8	12	20	8	12	20	10	10	20	12	8	20	9	11	20	11	9	20	67	73	140

would tax the ability of the most rapid recorder.

For the present study, therefore, 140 children were selected, 20 at each of the seven age levels of eighteen, twenty-four, thirty, thirty-six, forty-two, forty-eight, and fifty-four months. In order that age trends might be revealed more clearly, even with a limited number of cases, these seven age groups were discrete with respect to age, each child being examined within a month and a half of the exact age at which he was classified. These differences, only four of which exceeded 40 days, usually canceled each other, so that the average age of each group differed from the exact age by which the group was known by not more than a week. Half-year rather than whole-year age groups were employed in order to give a more complete picture of the curve of linguistic development during a period of rapid change.

Sex.—In the experimental group as a whole the two sexes were about equally represented, as it included 67 boys and 73 girls. Within each age group both sexes were adequately represented, the ratio never exceeding 8 to 12 in any age group of 20 cases (see Table 1).

Paternal Occupation.—The occupation of the father was used as a criterion in order to secure a group of preschool children which was as nearly as possible representative of the preschool population of Minneapolis, where the study was conducted. The subjects were carefully selected so that each of the six categories in Goodenough's Barr-Taussig occupational classification (2, Appendix *A*) would be represented in the same proportion by the children in the experimental group as they were among the adult males in the city between twenty-one and forty-five years in the 1920 census data. The matching was very close for the total group, as may be seen from Fig. 1, and was moderately so within each of the seven age levels as well.

Intelligence.—Mental test records based on the Kuhlmann Revision of the Binet Scale (1922) which were available on 95 per cent of the cases yielded a mean I.Q. of 109.1 for the group as a whole, 105.6 for the boys and 112.6 for the girls. This is only two points higher for the group as a whole than was obtained in Kuhlmann's normative group at these age levels. Thus, the experimental group, while perhaps slightly more highly selected than a cross section of the population with regard to general intelligence, in spite of the above-described precautionary measures, was more nearly representative than any previously assembled experimental population among whom language development had been investigated.

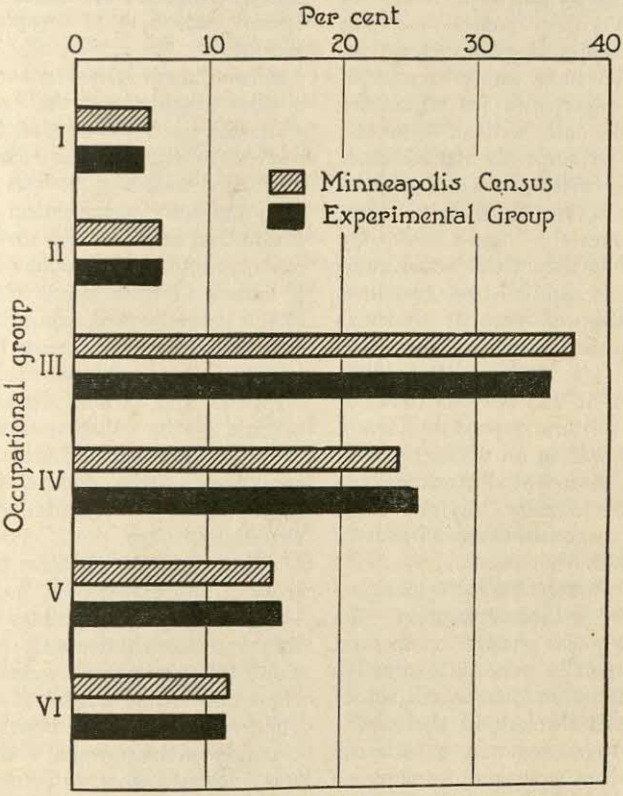

FIG. 1.—Distribution of cases by paternal occupation.

Method of Observation.—Each child was observed individually in his own home or in a place very familiar to him, such as a room in the nursery school or in one of the day nurseries of which the child was a member. Whenever possible, the child was alone in the room with the examiner, but in making home visits this condition was often difficult to control.

Fifty consecutive verbal responses were recorded for each child exactly as they sounded to the experimenter. This number gave a fairly representative sample of the child's stage of linguistic development in a relatively short period of time, without tiring the child with a prolonged observation.

A response was considered as a separate unit if it was marked off from the preceding and succeeding remarks by pauses. A complete sentence was always considered as a single response, but a response was frequently less than a sentence. The responses were recorded exactly as they sounded to the experimenter, even in the cases of the youngest children, many of whom gave verbal responses that were entirely incomprehensible. However, these children have many sounds in their vocal repertories for which we have no adequate written symbols; hence, any attempt to record their utterances in writing is very unsatisfactory. Such responses have been treated separately, and the only accurate result they yield is the number of syllables combined per response. In some cases of peculiar articulation, the mother's interpretation was considered if it clarified the child's speech and if it was obvious that she was giving a literal reproduction and was not elaborating on what the child had said. The record did not include recitation of nursery rhymes from memory or responses uttered in direct imitation of another person.

In order to overcome self-consciousness and to establish rapport, the child was shown picture books and toys which usually were quite effective as an introduction. The same set of toys was used throughout the experiment. The toys used were a little red auto, a cat that squeaked, a telephone with a bell, a little tin mouse, a music box, a small ball, and two picture books. The toys were not presented in the same order to all children. Frequently, the older children were asked whether they preferred to look at toys or picture books first. A preference was usually indicated, but if not, the experimenter presented the toy that seemed best suited to the age, sex, and apparent interest of the child. If it failed to bring forth any verbal responses after considerable inspection on the part of the child, another toy was tried. Sometimes a child became so fascinated with the first or second toy that the quota of 50 responses was obtained without the presentation of other toys. Some of the children, on the other hand, flitted from one object to another so rapidly, and with so few comments, that the whole series was gone through several times before the desired number of responses was obtained.

Since the aim was to secure spontaneous responses, the child was addressed as little as possible during the observation. In the cases of some quiet, shy children, it was necessary to stimulate conversation to some extent, but an effort was made, in such cases, not to use questions that could be answered by a single word. If the child's response was brought about by something the examiner or the mother had said, it was recorded as an *elicited response*, and, where necessary, the remark of the other person was also recorded verbatim. In this way equal samplings of the children's language responses were recorded in similar situations.

Other data obtained for all the subjects of the experiment included: the length of time required to secure the 50 responses; the time of the observation (appointments were made at times that would not interfere with the children's usual nap hours); the nationality of the parents, if they were of foreign birth; whether or not the child heard a foreign language in the home; the age of the child's associates; and whether the child had lived chiefly in the home or in an institution.

Analysis of Data

In any attempt to deal with data of this sort, one is immediately confronted with a great many difficulties. Everyone who has tried to understand the chatter of little ones realizes from this casual observation how difficult it is to hear the child's words correctly. Children of eighteen and twenty-four months vocalize a great deal, and whether we understand them or not, we cannot afford to ignore these important stages in their linguistic development. Even children who can be readily understood most of the time frequently use words and phrases that are entirely unintelligible to the hearer. It was necessary, therefore, to divide the data of this experiment into: (*A*) comprehensible responses, which included all responses that could be understood by the experimenter in spite of poor articulation, letter substitutions, or faulty or incomplete construction; (*B*) semicomprehensible responses, which included all responses in which the hearer had a general idea of what the child was talking about, but could not get the full meaning because of the lack of certain key words in the sentence; and (*C*) incomprehensible vocalization, which included all responses which were mere sounds forming no recognizable words and which were entirely devoid of meaning to the hearer. These responses included three subgroups: (*a*) single sound; (*b*) repetition of the same sound, or babbling; and (*c*) series of varied sounds.

Analysis According to the Length of Response.—The only quantitative treatment of these data that is possible is the analysis according to the length of response. The semicomprehensible responses and the incomprehensible vocalization were scored according to the number of syllables combined per response, while the comprehensible responses were scored by the number of words per response. In attempting to count the number of words in a response, many problems arise as to what is to be considered a separate word and what combinations are to be counted as one word. In order to overcome these difficulties and to standardize this part of the scoring system, it was necessary to formulate a set of arbitrary rules, as follows:

1. Contractions of the subject and predicate like "it's," "we're," "you're," etc., were scored as two words. In such cases the child speaks correctly according to adult conversational usage, which really is his only model of correct speech. Each part of the contraction is an essential part of the sentence, and if the sentence is to be considered complete, it is necessary to recognize these two parts. In order, therefore, to make the analysis according to the length of response consistent with the later analysis according to the construction of the response, it seemed justifiable to score such contractions as two separate words.

2. Contractions of the verb and the negative like "can't," "won't," etc., were scored as single words. The child who has no knowledge of how words are written does not know that "can't" is a contraction of "can" and "not." He hears "can" as one word and "can't" as another; they have different meanings and hence are probably two distinct and independent words to the child.

3. Hyphenated words and compound nouns, particularly proper nouns, which are not hyphenated but which probably function as single words and as names of single objects, were scored as one word. For example, "merry-go-round," "Mother Goose," "Betty Lou," and such expressions were scored as single words.

4. Each part of a verbal combination was scored as a separate word. For example, "have been playing" counted as three words.

5. "Lookit," which occurred frequently, was scored as one word if it was used alone and functioned simply as "look." If, however, it was followed by an object, it was counted as the two words "look at."

Functional Analysis.—In considering the linguistic development of the young child, it is important to consider not only the increasing length of speech units and their increasing degrees of complexity as the child grows older but also the functions of the child's speech in relation to his environment. What situations in which the child is placed bring about language responses? The young infant very early expresses himself in gestures, but when he begins to substitute verbal responses for his overt bodily responses, which overt responses are first superseded by verbal responses and in what situations does speech first appear?

Piaget (4) considers this a problem of functional psychology, which indeed it is. Sometimes, he says, language conveys information, sometimes it provokes action in others, etc. This is an important aspect of the linguistic development of the young child that has heretofore been neglected. The old grammatical classification of sentences into declarative, interrogative, imperative, and exclamatory sentences is a crude analysis in this direction, which serves fairly well for written language and less well for adult conversation and is quite inadequate when applied to the speech of children. As Claparède so aptly says in the preface of Piaget's book, "In examining child thought, we have applied to it the mould and pattern of the adult mind."

So often a sentence is structurally of one kind and functionally of another; there is so much overlapping of the categories; and so many subheads would have been necessary to make it meet the demands of children's conversation, that the rigid grammatical classification of sentences was abandoned in the present study. The function of the child's response in relation to his environment was considered the important thing in this type of approach. Practically the only attempt at treatment of this sort that is available in the literature is that of Piaget. This method has filled a serious need in the present study very satisfactorily and has been adopted with certain modifications in the functional analysis of the data. Modifications of the classification were made necessary by the different circumstances under which the observations were made, by the use of younger subjects, and by the desirability of subdividing some of the larger categories for a more detailed analysis. All of the comprehensible responses were scored according to this functional analysis, which, as modified for the present purposes, consisted of the following categories:

A. Egocentric speech.
  1. Repetition or echolalia.
  2. Monologue.
  3. Dual or collective monologue.
B. Socialized speech.
  1. Adapted information.
    a. Naming.
    b. Remarks about the immediate situation.
    c. Remarks associated with the situation.
    d. Irrelevant remarks.
  2. Criticism.
  3. Emotionally toned responses.
  4. Questions.
  5. Answers.
  6. Social phrases.
  7. Dramatic imitation.

By egocentric speech Piaget means that in which the audience is disregarded. The child "talks either for himself or for the pleasure of associating anyone who happens to be there with the activity of the moment." He "speaks only about himself and makes no attempt to place himself at the point of view of his hearer." In this study this category includes instances in which the child speaks about persons and things other than himself, but in which he disregards an audience. The three types of egocentric speech are defined as follows: Repetition or echolalia means "repetition of words and syllables . . . for the pleasure of talking, with no thought of talking to anyone, nor even at times of saying words that will make sense." Monologue occurs when the child "talks to himself as though he were thinking aloud" without addressing anyone. In the third type, called "dual" or "collective" monologue, "an outsider is always associated with the action or thought of the moment but is expected neither to hear nor to understand. The point of view of the hearer is never taken into account. His presence serves only as a stimulus . . . The child talks about himself without collaboration with his audience or without evoking a dialogue."

Socialized speech occurs when the child addresses his hearer, or considers his point of view, tries to influence him, or actually exchanges ideas with his hearer. The first category of socialized speech according to Piaget is adapted information, in which the child really "exchanges his thoughts with others, either by telling him something that will interest him, influence his actions, or by actual interchange of ideas." It occurs whenever "the child adopts the point of view of his hearer, and when the latter is not chosen at random." This group was found to include such a large proportion of the conversation obtained in this experiment that it seemed advisable to analyze it in more detail.

The first subgroup that appears to be quite distinct is that of naming, in which the child announces the name of an object either as a single word or in a complete sentence. The second type includes all remarks about the immediate situation, other than naming. The third group is made up of all remarks that are not about the immediate situation but are logically related to it, *i.e.*, where the observer can see the connection between events or remarks in the situation. For example, if upon presentation of a toy auto the child said, "It's a auto," the response would be placed in the naming group. If his next remark was, "It's got a spare tire," this remark would belong in the second type of adapted information, or the remarks about the immediate situation. If the succeeding remarks were, "I have a car like that," "Mine's broken," they would be additional information volunteered by the child, which was obviously brought about by the situation and associated with it, and hence belong in the third type of adapted information, or remarks associated with the situation. The fourth type of adapted information consists of irrelevant remarks; *i.e.*, those in which the observer cannot notice any connection with previous remarks or actions.

The second type of socialized speech is criticism, which includes "all remarks about the work or behavior of others, but having the same character as adapted information," according to Piaget's definition. In the present analysis, this classification was extended to include criticisms of objects as well as of persons and also complaints about situations in which the child is thwarted.

In the third group of socialized speech, Piaget includes all "commands, requests, and threats." For the present purposes, this category has been extended to include all emotionally toned responses. Single-word sentences uttered with a decided emotional or commanding inflection are also included in this group.

The fourth group consists of questions, by which are meant real interrogative sentences with an interrogative function and declarative sentences having an interrogative function, *i.e.*, any remark that definitely requires an answer from the hearer. It does not include declarative sentences with a question added at the end merely for affirmation or approval of the statement and requiring no answer on the part of the hearer, as "I made it go, didn't I?"

In the fifth group are included all answers that are "answers to real questions and to commands." In this study the category includes all the elicited responses. However, remarks occurring in the course of conversation which have the form of answers but are answers to remarks that are not questions are not placed in this category, but rather under adapted information.

A sixth category has been added to Piaget's classification to provide for the social phrases which occur only in social situations, but which the child has been taught to say parrot-fashion and which probably function as single words to the child, such as, "please," "thank you," "you are welcome," "bye-bye," etc.

The last group of socialized speech is called "dramatic imitation," which consists of all talk in imitation of the conversation of adults, like imaginary imitative telephone conversations. It also includes imitation of the sounds made by animals, like "bow-wow-wow," "meow," "moo-moo," and the imitation of the sounds of automobile horns, etc. Probably Piaget would put such remarks in one of the categories of egocentric speech, but, while many such remarks might be placed there, some of them are used in decidedly social situations and in social contexts, and hence this classification has been provided for them in this study.

Construction Analysis.—We have now outlined two methods of analysis of these data, both of which consider the response as a whole. The first was a quantitative analysis based on the length of response, and the second was a functional analysis of the response according to its relation to the child's environment or to the total situation. There is still another important aspect of the development of speech that must be considered. This is an analysis according to the construction of the response, which attempts to indicate the stage of grammatical complexity that the child has reached or to determine how closely his sentence structure approximates adult conversation.

The first and most obvious way to classify responses of this sort is to throw them into the dichotomy of complete versus incomplete sentences, and these are the two main groups of this type of analysis. However, in a preliminary perusal of these data, one is impressed with the frequency of responses that are incomplete sentences. Ordinarily, we think that adults speak in complete sentences and that the sentence is the essential unit of language. A superficial analysis of a small sample of adult conversation is sufficient, however, to show that a large proportion of adult conversation is composed of phrases and other groups of words that really do not constitute sentences according to the grammarian's definition. Often the whole sentence is merely implied or "understood." The child knows nothing of written language; his sole pattern and criterion of correctness of language is the conversation of the adults with whom he associates. If a response is adequate in the situation and is what an adult would say in such circumstances, the child is using the most complete form that he has had an opportunity to learn, and, therefore, in this study such responses have been classified separately as a type of complete response that is functionally complete but structurally incomplete. This group, then, includes practically all the single-word sentences and most of the elicited responses or those belonging in the answers group of the functional analysis. The outline of the classification used in this third type of analysis is as follows:

A. Complete responses.
  1. Functionally complete but structurally incomplete responses.
  2. Simple sentences without a phrase.
  3. Simple sentences with a phrase.
  4. Compound sentences.
  5. Complex sentences.
  6. Elaborated sentences.

B. Incomplete responses.
  1. Omission of the verb.
  2. Omission of the subject.
  3. Omission of a preposition.
  4. Omission of a conjunction.
  5. Omission of the verb and the subject.
  6. Miscellaneous omissions.

The category of elaborated sentences, which included sentences with two phrases, two clauses, or a phrase and a clause, was added to the construction-analysis classification in order to differentiate these more involved responses and to see if they proved indicative of a more advanced stage of linguistic development.

All responses that were incomplete functionally as well as structurally were scored as incomplete and classified according to the categories of the above outline. It was possible to give construction analysis scores only to comprehensible responses and to the more complete of the semicomprehensible responses.

Word Analysis.—In addition to the above-described analyses involving each verbal response as a whole, a word analysis was also conducted. Because of the representativeness of the sampling and the constancy of method in these data, it was thought that such an analysis might yield valuable comparisons with the voluminous literature of vocabulary studies.

While no estimates of the total vocabularies of the children can be made from these short samples of 50 consecutive responses, the age and sex trends in the number and variety of words occurring in such samples, as well as shifts in the proportions of the various parts of speech, are of considerable interest. The literature on children's vocabularies does not yield any consistent method of counting words. In this study, however, Bateman's rules for counting words and parts of speech which have been used by a few other authors have been employed. They are as follows:

1. Include no proper nouns.
2. Include no plural form unless the singular was not used.
3. Include all forms of pronouns.
4. Include no variants of verbs or of adjectives unless they are from a different root.
5. The same word may be listed more than once according to its grammatical use; *i.e.*, if a word is used as a noun and also as a verb, it is included twice.

Reliability

At first the classifications described in the various analyses may appear to be somewhat subjective and hence unreliable, particularly in the functional and construction analyses. Two checks on the reliability of the method were therefore employed. In the first, scores yielded by the odd-numbered responses were correlated with the scores yielded by the even-numbered responses. These correlations, after correction with the Spearman-Brown prophecy formula, yielded a mean reliability coefficient of +.91 for length of response, indicating a satisfactory degree of consistency in the responses which the children made. The categories of the functional and construction analyses also yielded satisfactory odd-even reliability coefficients (above +.85) where data were sufficient to warrant such an analysis. It is probable that the few categories which were inadequately represented would also yield satisfactory odd-even reliability coefficients if longer samples of conversation were employed.

The second approach to reliability attacked the problem of how consistently different scorers could interpret the scoring rules and classify the responses. Ten per cent of the data were therefore analyzed by four independent scorers. There was practically perfect agreement among the scorers on counting the words to determine the mean length of response, as indicated by a reliability coefficient of +.99. Again the size of the coefficients appeared to be related to the frequency of occurrence of the type of response under consideration, the less frequently occurring responses yielding the lowest coefficients. In general the classifications proved surprisingly objective as indicated by mean correlations for each scorer with every other scorer as follows: Scorer *A*, +.83; Scorer *B*, +.84; Scorer *C*, +.79; Scorer *D*, +.81. The average scorer intercorrelation for all categories analyzed was +.78, but this value would have been +.88 if the work of Scorer *C*, who was obviously less interested and less cooperative than the others, were omitted from the computations. It appears, then, that conscientious scorers can classify the responses of preschool children with a satisfactory degree of agreement.

TABLE 2.—MEAN PER CENT COMPREHENSIBLE RESPONSES BY CHRONOLOGICAL AGE AND SEX

Chronological Age, Months

	18	24	30	36	42	48	54
Boys	14.0	49.0	93.0	88.0	95.5	99.3	99.6
Girls	38.0	78.0	86.0	99.3	99.8	99.8	100.0
All	26.0	67.0	89.0	93.0	97.2	99.6	99.8

Results

Comprehensibility of Children's Speech.—Before proceeding with any of the major analyses it was necessary to separate the incomprehensible responses from those which were comprehensible. It may be seen from the figures in Table 2 that children's speech becomes increasingly comprehensible with increase in age, that it is almost entirely comprehensible by the age of three or three and one-half years, and that this development occurs somewhat earlier among girls than among boys. It must be borne in mind, therefore, that the number of responses upon which the figures in the major analyses are based is larger at the higher age levels and hence the figures are probably more dependable in the upper age groups.

Length of Response.—The most reliable single quantitative measure of the response as a whole is the mean number of words per response. As may be seen in Fig. 2, this measure shows a consistent increase with advance in age, the most rapid increase occurring between eighteen and forty-two months, with a more gradual increase after forty-two months. Girls used slightly longer sentences at six of the seven age levels. At the two-and-one-half-year level, where the only exception to this sex difference occurs, eight of the twelve girls happened to come from the lower socioeconomic classes, whereas five of the eight boys are from the upper occupational levels. This age level reverses the slight sex differences in favor of girls throughout the study owing to this sampling factor, and hence the crossing of the curves here should not be interpreted as having any comparative developmental significance for the two sexes.*

The mean length of response shows clear-cut differences among the children coming from the various socioeconomic levels. As may be seen from Fig. 3, the children whose fathers are professional men are definitely superior to the others, and those coming from the other occupational groups appear in their expected positions at nearly all age levels. There is very little crossing of the lines, most of it being accounted for by the sixth group, which was made up of children of day laborers, many of whom had contacts outside the home, such as in a day nursery or institution. When the data for the three upper and the three lower occupational levels are grouped, the differences in favor of the upper socioeconomic levels are statistically significant at the higher ages.

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* See chapter on "Language Development" by Dorothea McCarthy (1), for a summary table showing comparable data on length of response by C.A. and sex from ten investigations appearing between 1926 and 1941. In general the other studies tend to confirm these findings. Discrepancies can nearly always be accounted for on the basis of sampling or methodological factors.

When the mean length of response was studied in relation to mental age, the same general trends appeared as in relation to chronological age. The differences do not stand out so clearly, however, because the groups were not discrete with respect to mental age and there was wider dispersion in mental than in chronological age.

There is disagreement in the literature as to whether children who associate chiefly with adults learn to talk earlier and better than those who have child associates. In order to shed light on this problem the subjects of this experiment were all placed in three arbitrary groups on the basis of the ages of their associates. Group 1 includes all children who spend most of their time with associates over twelve years of age. Group 2 includes children who, in addition to association with adults, also associate with children who are more than two years older than they. Group 3 includes all children who, in addition to association with adults,

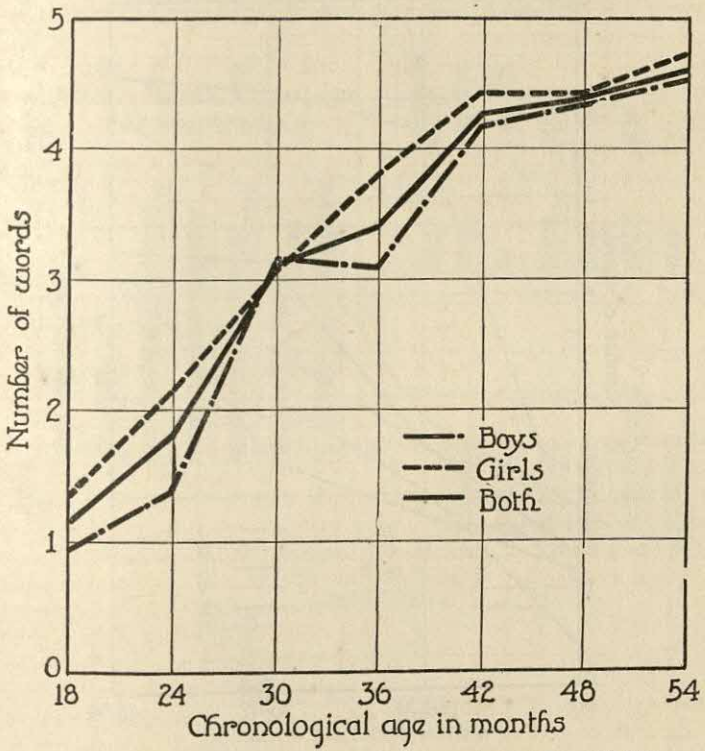

FIG. 2.—Mean length of response by chronological age and sex.

also associate with children their own ages or younger; *i.e.*, with children who are not more than two years older than they.

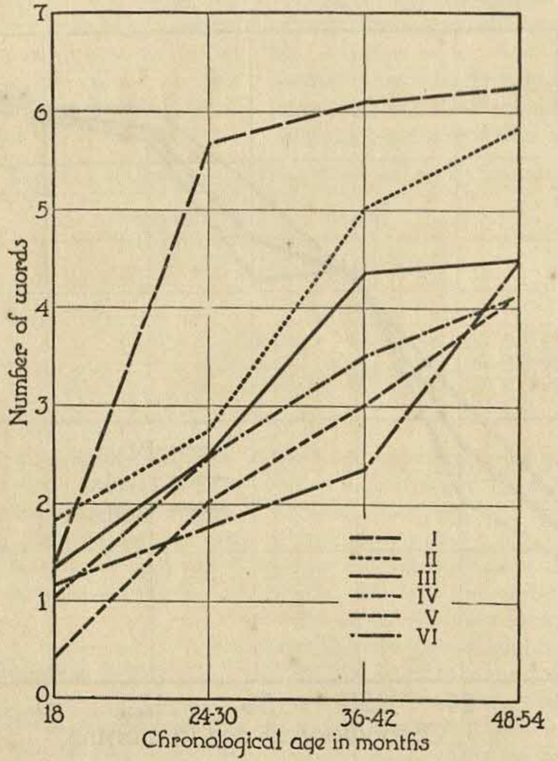

FIG. 3.—Mean length of response by chronological age and paternal occupation. The roman numerals refer to occupational categories.

These three groups were then considered with respect to the mean length of sentence. Each child was given a percentile rank within his own age level, on the basis of his mean length of response. Then the median percentile rank for each of the above groups was computed. The results of this analysis were as follows: For 27 children whose associates were chiefly adults, the median percentile rank for length of response was 70; for 70 children who associated with older children, 42.5; and for 43 who associated with children their own ages and younger, 52.5.

Thus, it appears that those who associate with adults only, seem to have a decided advantage in the length of sentence over those who associate with children. The figures for the other two groups, however, are the reverse of the expectations. Further examination of these data revealed that the children who associated chiefly with older children came predominantly from the lower socioeconomic groups where larger families affording such association are more numerous.

Bilingualism.—Fourteen children, or 10 per cent of the children in the experimental group, heard a foreign language in their homes. The median percentile rank for this group on the basis of mean length of response was 40, which is only slightly below the median for the group as a whole. This result is even more surprising when it is realized that nine were boys and only five were girls and also that ten were members of the lower socioeconomic levels and eight were the children of day laborers.

Thus, it appears that in spite of a predominance of boys and a great overweighting of the lower occupational groups, bilingualism does not seem to be a serious handicap in linguistic development as measured by the mean length of response. However, this does not mean that it is not a handicap to proper pronunciation and construction.

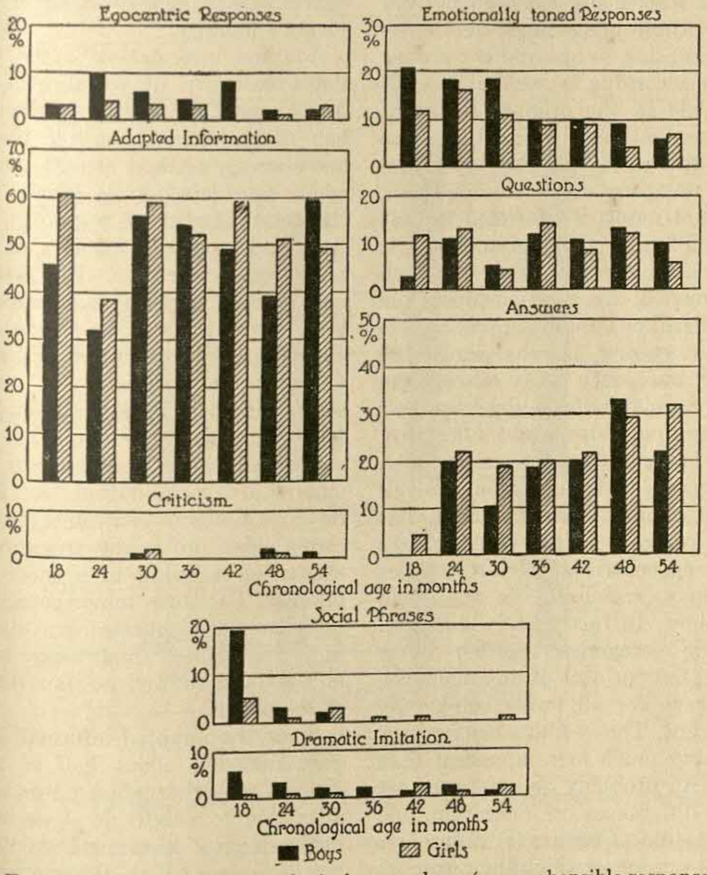

FIG. 4.—Functional analysis by chronological age and sex (comprehensible responses only).

Functional Analysis.—Another aspect of the child's language which is interesting to consider, and which has heretofore received very little attention from investigators, is the function of the response in relation to the child's environment. For what purpose does the child talk? What needs does he satisfy by the use of verbal responses? In what situations are verbal responses brought forth, what kinds of responses are used in these various situations, and what changes do these responses show as the child grows older? These are some of the questions upon which this analysis is intended to throw some light. It is an attempt to give a total picture of the child's language and its development from the functional point of view, as it is evidenced in the samplings obtained in this experiment.

As the usual grammatical classification of sentences into declarative, interrogative, imperative, and exclamatory sentences proved inadequate and inappropriate when applied to young children's oral speech, the functional analysis adapted from Piaget's classification, outlined above, was employed.

The percentage of the total number of responses falling in each category was determined for each child, and means of these percentages were computed according to age and sex groups as well as according to paternal occupation. While in the original report of this investigation this analysis was made both including the incomprehensible responses and excluding them, the present report is restricted to that based on only the comprehensible responses as shown in Fig. 4, which shows some of the relationships more clearly. Perhaps some incomprehensible responses belong in the egocentric category, but, since many others were definitely socialized as judged by their accompanying gestures and inflections, it seemed best to treat them separately.

The results of the functional analysis failed to confirm Piaget's claim that over 40 per cent of the young child's speech is egocentric and that it becomes increasingly socialized as the child grows older. In fact in this study all egocentric categories together never exceeded 6.5 per cent at any age level, the average for all levels being only 3.6 per cent. This seeming discrepancy is probably much more apparent than real. It can probably be accounted for by (*a*) differences in definition and interpretation of terms, (*b*) differences in the situations in which the responses were recorded, and (*c*) individual differences in the characteristics of the children observed. Undoubtedly children's speech is often egocentric in that they speak about themselves and their own activities, but it is at the same time socialized in that it is directed toward a hearer who is expected to understand and reply, and perhaps in this sense it is not much more egocentric than much adult conversation.* Since these data are reported in percentages, and the studies differ so markedly in the percentage of egocentric remarks, none of the other figures can be compared directly with Piaget's findings.

Adapted information is the largest single category of socialized speech. At all ages it represents approximately half of the comprehensible responses and shows a marked increase with age when considered as a percentage of the total number of responses. Questions and especially answers also show fairly regular increase with increase in age as more give-and-take appears in the conversations of the older children. Emotionally toned responses showed an interesting decrease with age. It seems, then, that the young child first talks comprehensibly about his wishes and about things that have a strong emotional tone and that this type of response becomes less important as he grows older and is able to express fine shades of meaning in a more subtle manner. The three minor categories of criticism, social phrases, and dramatic imitation yielded small percentages at all ages and showed no important age or sex trends.

Since the adapted-information category included about half of the responses at higher ages, it was thought advisable to subdivide it as outlined in the description of methods of analysis. Responses which were mere naming constituted about 87 per cent of the adapted information responses among the eighteen-month-old children and showed a marked decline to about 25 per cent by four years. Remarks about the immediate situation and remarks associated with the situation both show marked increases in the age range studied.

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* Other writers who have attempted to use Piaget's classification subsequent to this investigation have not substantiated his claims. For full discussion of this problem in the literature see chapter on "Language development" by Dorothea McCarthy (1).

As will be seen from the diagrams that have been under consideration in the preceding paragraphs, there is a consistent difference in the items that show trends with increase in chronological age in favor of the more rapid development of these functions among the girls.

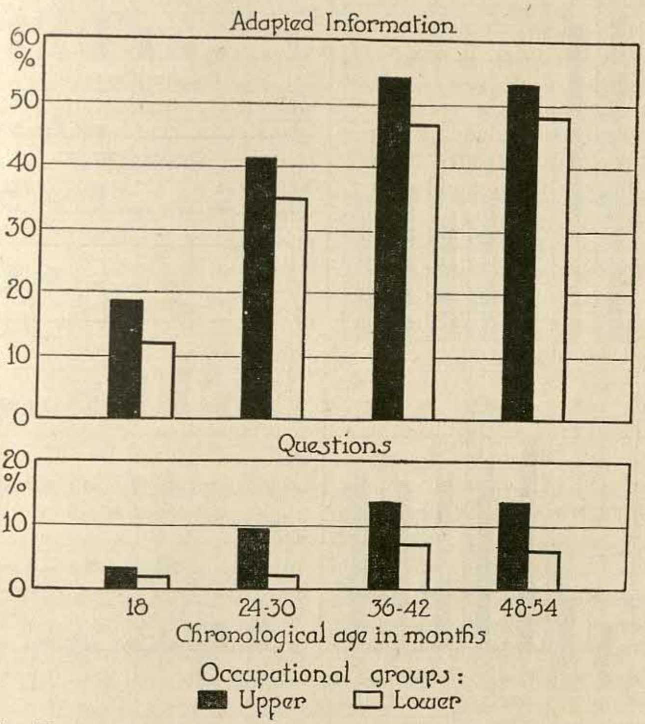

FIG. 5.—Functional analysis by chronological age and paternal occupation.

When the functional analysis was conducted in relation to paternal occupation it appeared that the children of the upper socioeconomic levels use a larger percentage of adapted-information responses and ask more questions at all ages than the children of the lower socioeconomic levels (see Fig. 5). No significant trends appeared in the analysis according to age of associates. Analysis according to mental age groups showed the same tendencies as were revealed in the chronological age analysis, although they are less marked and the sex differences are less clear-cut.

Construction Analysis.—It is important not only to measure the extent of the child's vocabulary and the increase in the number of different kinds of words and their proportions in the child's vocabulary from time to time, but also to consider the child's progress in the ability to combine these newly acquired words into various degrees of grammatical complexity. Which grammatical combination appears first, in what sequence do more advanced forms appear, and at what ages do they appear?

Adult conversational usage was the criterion of completeness of sentence structure in this analysis. The single-word sentence was scored as one type of complete response because of its adequacy in the situation. Omissions of articles were disregarded. Omission of any essential part of a verbal combination, such as the omission of the auxiliary, was considered an omission of the verb. In scoring the types of omission for the incomplete sentences, the simplest possible hypothetical completion of the response was used. It is for this reason that no omissions of adjectives, adverbs, or other modifiers appear in the list of omissions, for they are not essential to the simplest form of a complete sentence. The semicomprehensible responses, which were few in number, were scored according to the type of omission wherever possible. Grammatical errors in tense, number, case, gender, and the like were disregarded in this analysis. The emphasis has been chiefly on the complexity of the response as a whole, rather than on correctness of syntax.

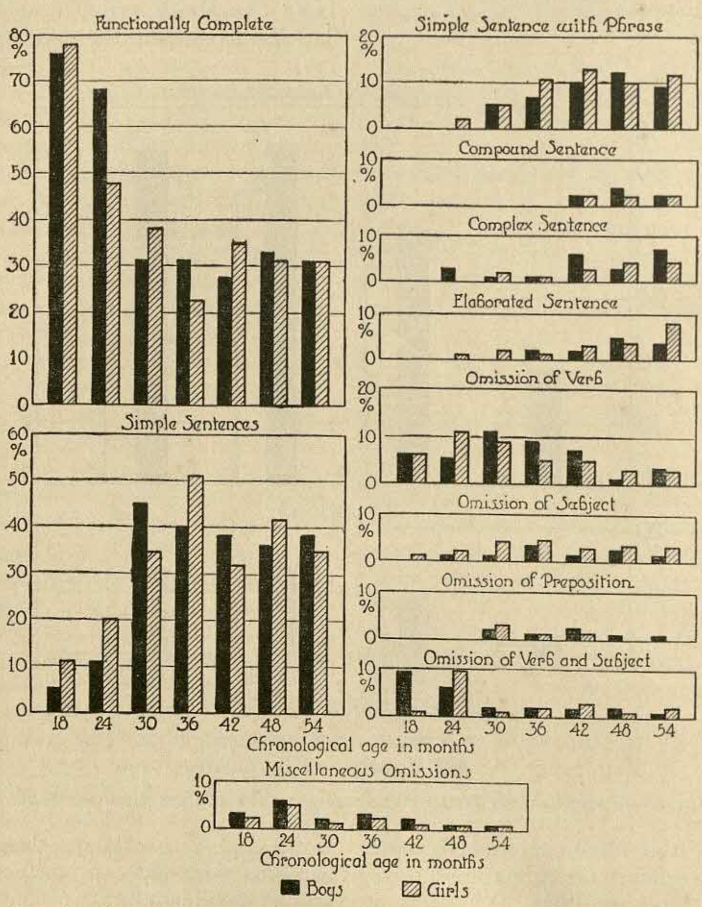

FIG. 6.—Construction analysis by chronological age and sex (comprehensible responses only).

Consideration of only the comprehensible responses brings out the changes that occur with increase in chronological age much more clearly. It will be seen in Fig. 6 that the functionally complete but structurally incomplete responses constitute the major portion (75 per cent) of the comprehensible responses of the eighteen-months-old children. They decrease in relative amount with increase in age, but they continue as a large proportion of the responses in the upper ages, owing to the increase in the number of answers. At twenty-four months the girls have fewer responses of this type than the boys, probably because of their more precocious development and the dropping out of the single-word sentence as the word combinations begin to appear. They do not continue to have a smaller proportion of this category, however, in the upper age levels, because of the increase in the number of answers, which were more numerous among the girls than among the boys.

The simple sentence without a phrase has already entered into the child's language by eighteen months but in very small proportions. The girls are superior to the boys in the number of simple sentences at the younger ages, but in the upper age levels, when the girls are acquiring the more complex forms, the two sexes are about equal in the proportion of their conversation which consists of simple sentences.

The phrase was considered an added complexity in sentence formation, which was analyzed separately in the simple sentence with a phrase. The phrase first appears among the girls twenty-four months old. They maintain a fairly consistent superiority over the boys in the proportion of simple sentences with phrases, until at fifty-four months 8.8 per cent of the total number of responses obtained from the boys and 12.2 per cent of those obtained from the girls belong in this category.

In the present investigation, compound sentences did not appear until the age of thirty months. They never exceed 4 per cent of the total number of responses at any age level, and no sex differences appear for this group. Complex sentences appear as a very small proportion at the age of twenty-four months. Their number remains small throughout, and no sex difference is noticeable.

The number of complex sentences given above is probably too small, since the sixth type of complete sentence—the elaborated sentence, which has been studied separately—includes the more involved of the complex sentences. The elaborated sentence group, which includes many complex sentences, first appears among the girls at twenty-four months and among the boys at thirty-six months. The group increases quite markedly with increase in age, the girls appearing slightly superior to the boys in the percentage of elaborated sentences.

The remainder of the responses, *i.e.*, those that were not included in any of the above categories, were scored as incomplete sentences and classified according to the different types of omissions. When considered in relation to the comprehensible responses only, the tendency for the incomplete sentences to decrease with advance in chronological age is apparent.

Omission of the verb, *i.e.*, some essential part of the verbal combination, proved to be the most frequent type of omission at nearly all ages, particularly in the lower age groups. Omission of the subject comes next in importance, but it is relatively less important at the lower age levels, in which the child is in the naming stage. The only other type of omission that is at all large is the omission of both the verb and the subject. None of the other types of omission occurred with sufficient frequency to indicate any trends with chronological age or sex.

The girls show a clear superiority over the boys in all the items of this classification that show developmental tendencies. The children of the upper occupational groups are markedly superior to those of the lower occupational groups in all of the items of the construction analysis. The same tendencies appear in the construction analysis when it is considered in relation to mental age as were found in relation to chronological age, although the sex differences are less apparent. No differences were brought out among the three age-of-associates groups on the basis of the complexity of grammatical structure.

Table 3.—Mean Number of Words and Mean Number of Different Words Used in Samples of 50 Consecutive Responses by Chronological Age and Sex

C.A., months	Mean number of words			Mean number of different words		
	Boys	Girls	All	Boys	Girls	All
18	8.7	28.9	20.3	5.4	13.6	10.0
24	36.8	87.1	66.0	16.6	37.3	29.1
30	149.8	139.6	143.7	52.8	49.8	51.0
36	164.4	176.2	170.3	60.1	66.0	62.8
42	200.8	208.0	203.7	76.7	90.6	82.3
48	213.4	218.5	216.3	91.1	93.8	92.6
54	225.4	236.5	230.5	95.8	104.0	99.5

Word Analysis.—In the present study, while no attempt has been made to secure a complete record of each child's vocabulary, a sampling of each child's language has been obtained under the standardized conditions described above. A word analysis of these responses should give a picture of the composition of the active vocabulary of each age level as it is obtained in a short sample of running conversation. According to the method used in this investigation, however, the particular words used were determined largely by the situation. The results of this analysis, therefore, do not give any indication of the extent of vocabulary, but rather give a picture of the proportions of the different parts of speech as they enter into representative samples of the child's running conversation.

Throughout the tabulation of the words, the functional use of the word was regarded as the significant aspect to consider in the classification. All responses were therefore placed in the various categories of the different parts of speech, according to how they were used in the sentence. If the same word occurred as more than one part of speech, it was counted twice. Proper nouns were not counted as different words. Articles and numbers were included as adjectives. Childish forms of the same words were counted as different words. All parts of verbal combinations were counted as separate words and as verbs. Auxiliaries and participles always counted as verbs except when the latter were used as adjectives. The variants of verbs, adjectives, and pronouns were not counted as separate words unless they were irregular and the roots of the words were changed.

The total number of words used by each child during the observations increases markedly with age, starting with 20.3 words at eighteen months and increasing to 230.5 words at fifty-four months, as is shown in Table 3.

It will be noted from Fig. 7 that the percentage of nouns, which is 50 per cent of the total number of words used by the eighteen-months-old children, decreases in relative amount to about 19 per cent. The verbs increase from about 14 per cent to 25 per cent in the age range. Adjectives almost double in the proportions of the total number of words from eighteen to fifty-four months. Adverbs show no consistent tendency with increase in age, and they never exceed 9 per cent of the total number of words used. Pronouns represent about 10 per cent of the total number of words used by the eighteen-month-old children, and they increase to approximately 20 per cent of the words used by the fifty-four-month-old children. Prepositions do not appear at all among the eighteen-month-old children and increase with age from about 3 per cent at two years to about 7 per cent among the older children. Conjunctions appear late, and, although they show a steady increase with age, they never equal more than 4 per cent of the total number of words obtained. Interjections decrease with age from 16 per cent of the words of the boys eighteen months old to less than 1 per cent among the children of fifty-four months.

The mean number of words secured from the girls is greatly in excess of the mean number of words used by the boys at the lower age levels, but this tendency becomes less marked at the upper ages. As may also be seen from Fig. 7, the sex differences in favor of the girls, which were noted in connection with the other types of analysis, also appear in this analysis according to the various parts of speech.

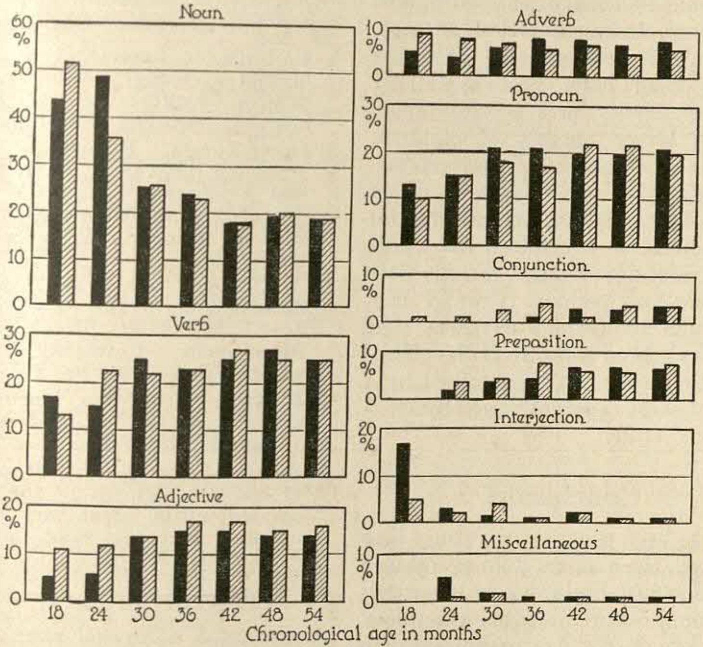

FIG. 7.—Parts of speech by chronological age and sex (based on total number of words used in 50 responses per child).

It is obvious that the proportions of the parts of speech according to the number of different words is determined largely by the proportions of the different parts of speech that are represented in the dictionary. When, however, the active vocabulary is considered regardless of variety, a much better measure of linguistic development is obtained. This is seen by the fact that the changes with age appear so much more clearly in the analysis according to all the words used.

It has been shown that, in considering the parts of speech as they appear in the child's vocabulary, we are dealing with material that is rather questionable from the psychological standpoint. The question of the part of speech under which the single-word sentence is to be classed, the problem of the inclusion of variants of words, the use of the total number of words, or simply of the number of different words used—all make material of this sort rather elusive. It is well to note, however, in connection with the method used here, that essentially the same results have been obtained for this larger number of children, using only samplings of their speech recorded in a comparatively short period of time, as have been found for small numbers of children for whom very careful and detailed records were kept over long periods. It would seem from such indications as these that nearly as good a measure of the child's linguistic status can be obtained by a series of short observations as by long-continued study.

Conclusion

As has been shown in the study here described, the average child of eighteen months is just beginning to use words to communicate his ideas to others. Previously, he could communicate with those around him only by crying and by gestures. By the age of four and one-half years, he is a highly social individual, using language for his every need and desire, not only physical, but intellectual, and, in addition, he is using all the most complex forms of sentences found in adult conversation and his vocabulary amounts to several thousand words. A glance at any of the charts will suffice to show that the changes that occur are very rapid up to three and one-half years of age. From then on, the developmental process continues at a slower rate for the next few years. The decrease in the percentage of the child's conversation that is incomprehensible and the increase in the mean length of response are among the most striking changes. This rapid development in such an intricate and distinctly intellectual function is indeed remarkable, when we realize that it occurs in individuals who are decidedly immature physically and who have mental ages of only two, three, and four years.

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CHAPTER VIII

THE DEVELOPMENT OF CHILDREN'S CONCEPTS OF CAUSAL RELATIONS*

JEAN MARQUIS DEUTSCHE

Introduction

The scarcity of research on children's thinking and our consequent limited knowledge of the subject are not to be explained by a lack of interest in the problem or by a lack of appreciation of its importance, but rather by the extreme difficulty of formulating experimental methods for investigation which meet the needs of the problem and answer our questions.

The present investigation is concerned with the nature and development of children's concepts of causal relations, which is one phase of children's thinking. An understanding of how children think and of what factors are important in the development of child thought will be reached only through further investigations of the various aspects of the problem.

Using the individual-interview method, Piaget (5) studied children's explanations of various events. Through experiments, questions, and demonstrations he investigated their ideas about the nature of air, the origin of wind and breath, the movement of clouds, the floating of boats, etc. As a result of these investigations, Piaget classified 17 distinct types of causal explanations, each characteristic of a different stage in the development of causal thinking.

The research of Piaget and his followers suggests these questions:

1. What is the nature of the development of causal reasoning in the child? Does causal thinking develop in stages? Are there sudden spurts in its development, or is there a gradual development in reasoning? Are certain stages (or levels) in the development of causal reasoning characteristic of certain ages, or is there great overlapping between ages? Is there a general factor of reasoning, *i.e.*, do children tend to give causal explanations of the same general level for all questions of causality, or is the level of the explanation specific to the particular question?

2. What is the value of Piaget's classification of 17 types of causal thinking? Is this a valid classification? Are the types adequate and representative? Is it possible to use this classification to advantage?

3. What relationships do other factors bear to the development of causal thinking? Specifically, what is the relationship to causal thinking of factors such as sex, intelligence, and socioeconomic status? What is the effect of schooling and specific instruction upon the kinds of causal explanations children give?

4. Is there evidence which will answer the question of the relative importance of maturation (stages determined biologically) and experience in determining the concepts of a given child?

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* From a monograph by the writer (1). Adapted with permission of University of Minnesota Press.

The Experiment

Forms of the Test.—A list of questions of causality, some original and some selected from the literature, was compiled with four criteria in mind: (*a*) The questions based on demonstrations of experiments had to be practical for performance in the schoolroom. The apparatus involved had to be small enough to be transported easily, the action of the experiment had to be simple enough for the children to distinguish what happened, and the apparatus had to be large enough and simple enough so that children all over the room could observe the facts of the experiment. (*b*) The problems involved in the questions had to be definite, *i.e.*, the children must be able to understand clearly what they were expected to explain. (*c*) Questions had to elicit answers with a considerable range of completeness in order that age relationships could be observed. In order to get answers from all the children and answers with a wide range of adequacy as explanations, the questions had to be neither too hard for the young children nor too easy for the older ones. (*d*) The questions necessarily had to be such as to provoke some kind of reply from most of the children. A large percentage of omissions would have precluded any possibility of analysis. A preliminary trial with 14 adult students and 12 children between eight and fifteen years of age facilitated the selection of the questions which comprised the two final forms of the experiment. The two forms are given below.

Form I (with experiments)

1. *Candle in Jar.* Jar is placed over a lighted candle. Why does the candle go out?

2. *Penny in Box.* Cardboard box top with strings attached to each corner is whirled vertically with a penny in it. Why doesn't the penny fall out?

3. *Level of Water.* A large pebble is dropped into a beaker partly full of water. Why does the water come up higher when I put the pebble in?

4. *Block Dropping.* Small wooden block is dropped from a height of 2 ft. above table. What makes the noise when the block falls?

5. *Changing Color of Liquids.* Beakers of blue and yellow water, to which hydrochloric acid is added, changing them to yellow and red respectively. What makes the water change color when I pour in some of this colorless stuff?

6. *Bulb on Tube.* Water repeatedly drawn into hydrometer. What makes the water go up in the tube when I let go of the bulb?

7. *Teeter-totters.* With two teeter-totters, one with the fulcrum in center and the other with the fulcrum definitely off center, demonstrate that one balances with equal weight blocks on the ends and the other does not. The second one balances if a larger block is put on one end. Why do I have to put a big block on one end to make this teeter-totter balance?

8. *Mixed Liquids.* Test tube containing water, carbon tetrachloride, and methyl red is shaken and stood on end. Why does the colored liquid separate from the colorless liquid?

9. *Paper over Jar.* Glass jar partly filled with water is covered with paper and inverted. Why don't the paper and water fall out of the jar?

10. *Musical Instrument.* Horn, with keys and reeds, is played. Why does it make different sounds when I push different keys?

11. *Water Level of Connected Tubes.* Connected glass tubes, with turnstop in connective tube. Water is put in one tube and stopper turned. Why does the water run uphill in the little tube?

Form II (without experiments)

1. What makes the wind blow?

2. What makes the snow?

3. Why do balloons go up in the air?

4. Two men, both named Carl Jenkins, were killed at 4 p.m. the same day, one in San Francisco, one in Kansas City, and both were killed in automobile accidents. How do you explain this?

5. What makes the rainbow after the rain?

6. What makes airplanes able to stay up in the air?

7. What makes frost on the windows in wintertime?

8. Why do boats float on top of the water instead of sinking?

9. A man built a barn and it was hit by lightning. He built it again three times, and each time lightning struck it and it burned. How do you explain why it was struck by lightning four times?

10. What makes shadows?

11. What causes thunder?

12. How is it you can see yourself when you look into a mirror?

Administration and Subjects.—Form I of the questionnaire was administered to children in grades 3 through 8 of one school; to children in grades 3 through 6 of another elementary school; and to two sections each of grades 7*B*, 7*A*, 8*B*, and 8*A* of a junior high school. Form II was given in the two latter schools. The tests were given to one schoolroom at a time. After the general nature of the project had been explained the experimenter demonstrated the phenomena in Form I. Sufficient time was allowed after each demonstration for all children to complete writing their explanations on the mimeographed forms which had been supplied. In giving Form II, the questions were read aloud by the investigator in grades 3 through 6, and sufficient time was allowed for the writing of the answers before the next question was read. In grades 7 and 8 the children were allowed to work independently at their own rate of speed. The motivation factor was supplied by the tests themselves, which aroused a surprising amount of interest. The attention of the children was held completely, and there was much evidence from their reactions that they were cooperating fully. Further evidence that the motivation was adequate is found in the completeness of the responses. The number of omissions and incomplete responses was very low.

Seven hundred and thirty-two children were tested, 700 taking Form I, 335 taking Form II. Approximately the same number of boys and girls took each form of the test. The age range was from eight to sixteen, with the greater proportion of cases in the middle range. Ratings of socioeconomic status* showed the younger children to be slightly higher than older children in socioeconomic status, and the group as a whole to be of slightly higher status than that of the average population of Minneapolis as determined by the 1930 census (3). The age-grade distribution is normal in the middle range but indicates some selection on the basis of intelligence at the extreme ages, the dull eight-year-olds not having reached grade 3, the superior fifteen- to sixteen-year-olds having gone beyond grade 8. Available data on intelligence (429 cases, based on three different tests) are insufficient to determine the intellectual level of the group but suggest that the group is of only slightly more than average intelligence.

Analysis of Quantified Scores

Derivation of Scores.—A quantified system for scoring the answers to the various questions was desired. A measure of the adequacy of the answers *as explanations of the phenomena involved* would not only give a measure of the child's understanding of the problem but would also provide a means to study the development of the child's understanding and to determine the relation of this development to other factors.

Since there were approximately twelve thousand answers to questions, it would have been entirely impracticable to deal with each answer individually in the analysis of the data. All the answers to one question which were identical in expression or content were therefore grouped. The frequency within the groups was from several hundred to one. It was necessary to make a special grouping for each different answer regardless of its frequency in order to preserve the actual answers of the children. The number of groupings necessary varied from question to question. The answers to the question about the candle in the jar (Form I, No. 1) were classified into 16 groups, whereas the answers to the question about the water in connected tubes (Form I, No. 11), required 35 groups for complete classification.

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* Utilizing Institute of Child Welfare revision (2) based on Barr ratings of Taussig scale.

Thirteen graduate students rated the answers, assigning an arbitrary score value to each of the answer groupings. For example, on the question "What makes the candle go out?" there were 16 groups of answers, each to be assigned a score value of from 0 to 7. On the rating scale, a score of 7 represented a correct and complete answer, 6 very good, 5 good, 4 fair, 3 inadequate, 2 very inadequate, 1 entirely incorrect, and 0 no answer, incomprehensible, etc. For a rating of 7, a correct answer, all essential principles had to be mentioned or implied and the right relationships stated. For an answer to have a rating of 4 there had to be some sense of the true relationship although it might be inadequately explained. A rating of 1 was given if entirely wrong principles, relations, and agents were utilized in the explanations. Each rater was furnished with definitions of the scale values, and, in order to be sure the raters understood the phenomena, a set of complete and accurate explanations of the phenomena. They were reminded that the answers were to be rated on their adequacy *as an explanation of the phenomena,* not as to their psychological value.

The reliability of the ratings was determined for each question by correlating the mean ratings of six judges with the mean ratings of six other judges. With one exception (.867) the correlation between mean ratings of the two groups was above .90, and for over half of the questions the correlation was above .95, indicating that the ratings of these judges were highly reliable.

The raw median value for each answer, while an adequate measure for comparison of answers to a single question, would not necessarily give scores comparable from question to question. A weighting scheme was devised to give scores comparable on all the answers. The procedure was as follows: (*a*) The median rating scale value for each answer was expressed in terms of its percentage of the perfect score, 7. (*b*) This percentage value was converted to the standard score value ($\sigma \times 10 + 50$) corresponding to that percentage in terms of the normal probability curve. (*c*) This value was multiplied by 2, 46 was subtracted, and the remainder divided by 10 in order to secure manipulable small score values. Such transformation in no way alters relative values since all scores were treated with constants. (*d*) The nearest whole number to the score thus obtained became the final quantified score.

In order to illustrate the grouping of answers and the quantified scores assigned to them by this method, the groupings of answers given to the question "What makes thunder?" (Form II, No. 11) are given.

Answer Group	Quantified Score
Lightning pushes air away, heats air, cold air rushes in and bumps	8
Lightning cuts or splits air, or makes vacuum, and air rushes together again	7
Positive and negative charges heat air or send air away, and cold air rushes in and bumps	7
Air rushing into hole; going apart and coming together	6
Positive or negative clouds or forces discharge or meet	5
Heat or hot air causes it	5
Hot and cold air or clouds meet or bump	5

Answer Group	Quantified Score
Lightning makes it (inadequate or incorrect answer)..........	5
Electricity—too much, or no explanation..................	4
Air, air and moisture, air pressure, make it................	4
Two clouds hitting together (no explanation).............	4
Storms cause it.................	4
Incorrect—mountains, ocean, waves, water, etc............	3
Rocks rolling in sky, or down mountains..................	3
Clouds make it................	3
Various fanciful stories (giants snoring, people in heaven making noises)................	3
God makes it................	3
Rain causes it................	3
Something clouds do (hit lightning, hit trees, break, etc.)...	3
Earth shakes or rumbles........	3
Don't know, incomplete, omitted	0

Reliability of the Test.—To determine the reliability of the test, split-half and form-versus-form correlation coefficients were computed between the odd and even quantified scores on each form and between the total scores of individuals on the two forms. The odd-even correlations are: Form I (700 cases), .588, P.E., .017; Form II (335 cases), .575, P.E., .025. The consistency in level of response for individuals is found to be low. When the Spearman-Brown formula is applied, however, these correlations are increased to .740 for Form I and .730 for Form II.

Correlating the total scores of individuals on Form I with scores on Form II, the coefficient is .534, P.E., .06 (65 cases). The correlation between the two forms is relatively high when it is considered that one form consists of experiments involving strictly physical principles, whereas the other consists of a combination of items involving questions about phenomena in nature.

Age and Sex Trends in Quantified Scores.—Since the quantified scores were derived by ratings based on the adequacy of the answer as an explanation of the phenomenon, it is reasonable to expect an increase in scores with age. If the answers were to show a progression from low to high scores with increasing age, it would be a partial validation of the method of obtaining the answer and of the method of scoring. Unless the answers reflect the approximate level of ability of the subjects, this age progress would scarcely be found.

Figure 1 shows the mean quantified score for each question for Form I of the test, as plotted by age for the two sexes separately and for both sexes combined. Each question on both forms of the test shows an increase in mean score with age. The amount of increase is greater on some questions than on others. This difference is apparently related to the difficulty of the question and to the degree to which the answers may be affected by specific teaching. Although the answers to each question improve with age, the improvement as measured is not consistent at all ages. The many irregularities in the curves may be explained largely by the small number of cases in certain age groups. There is a tendency for the mean score to drop at the fifteen- to sixteen-year level and for the mean score to be slightly higher at the eight-year level than at the nine-year. This may be accounted for by the selection of cases, as well as by the smaller sampling at these two extremes.

It seemed probable that a sex difference in ability to answer questions involving causal relations would be found, as there is a widespread opinion that boys are more interested in the explanation of physical phenomena than are girls. The boys' greater interest in causal relations might result in a greater knowledge of such relations and consequently in a great ability to explain the phenomena used in the test. An inspection of Fig. 1 shows clearly that the boys' answers are superior to the girls'. This tendency is marked and consistent in Form I of the test, where the mean score on each question is higher for boys than for girls. On no question are girls consistently superior to boys. The data on Form II are less clear-cut for two reasons. One is that the small number of cases precludes the possibility of drawing continuous curves over the entire age range for each sex. The other is that the difference between the two sexes is smaller, and consequently no consistent differences hold at the ages where the data are adequate. Girls are slightly superior on only three questions of Form II—questions that are likely to have arisen in the child's experience and to have been answered by adults. This suggests

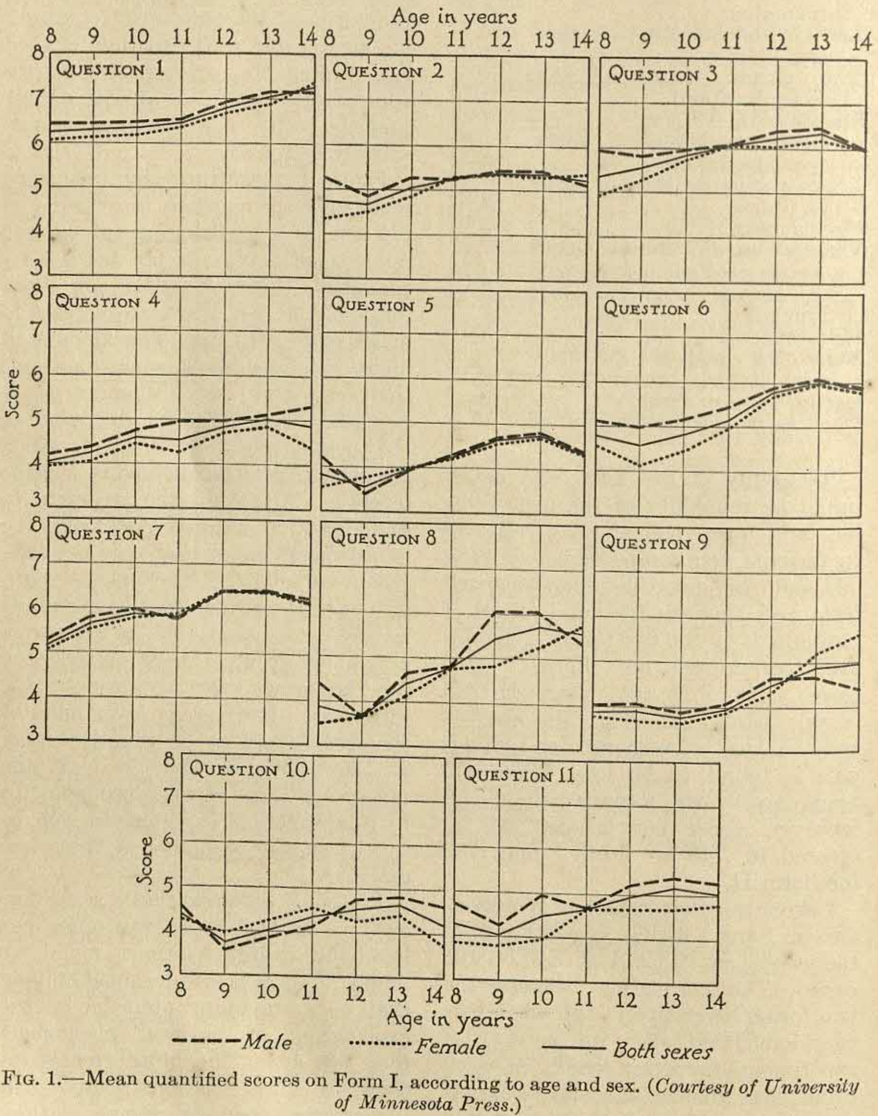

FIG. 1.—Mean quantified scores on Form I, according to age and sex. (*Courtesy of University of Minnesota Press.*)

that there is little sex difference on questions allowing for more instruction and experience with the phenomena, but that boys are superior when confronted with novel phenomena requiring the application of general principles.

Socioeconomic Status, Intelligence, and School Grade.—The quantified scores were analyzed in relation to the socioeconomic status of the child to determine whether the advantages which we know are related to high socioeconomic status, and others which might be related (such as more intelligent handling of questions, more facilities for study, more specific explanations or teachings), have operated to make the children in the upper groups more capable of giving adequate answers. A single age group (age twelve) was used to prevent the age-

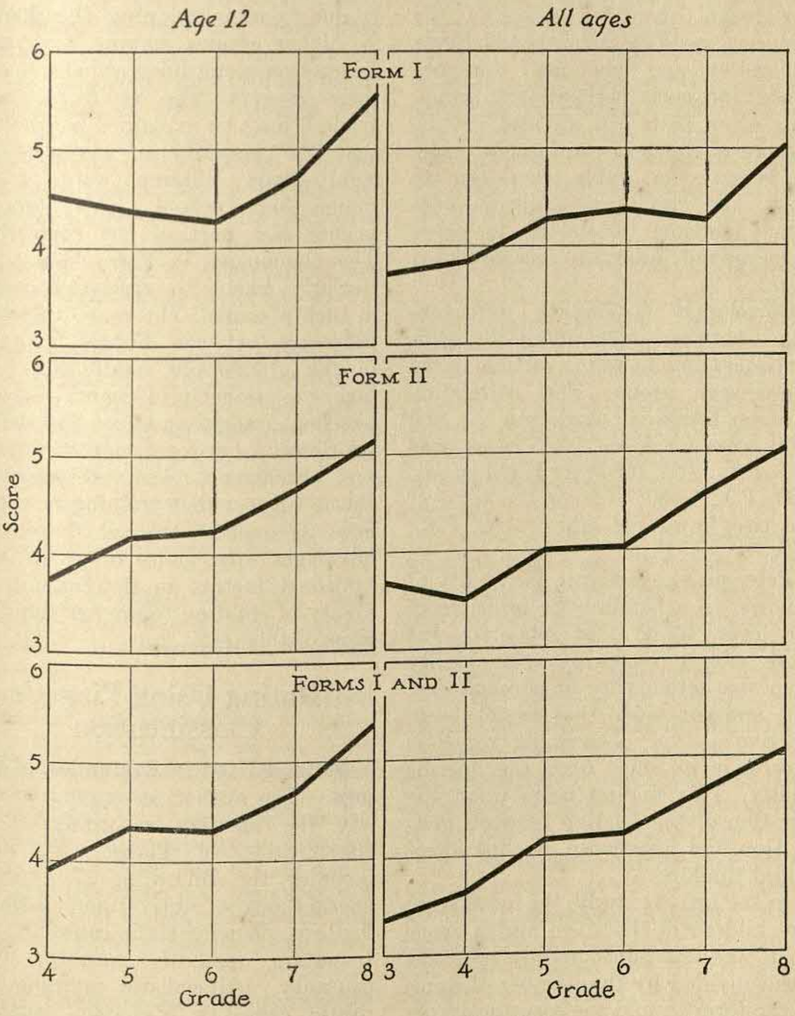

Fig. 2.—Mean quantified scores at age 12 and at it all ages on Form I, Form II, and the two forms combined, according to school grade. (*Courtesy of University of Minnesota Press.*)

score relationship from obscuring any socioeconomic-score relation. This age was chosen because of the large number of cases and because the data on socioeconomic status and intelligence were more complete than for any other age. The mean quantified score of the twelve-year-old group on the two forms (separately and combined) was obtained for each occupational group. This mean score was divided by the number of items in the form to make the scores comparable from form to form. The results revealed no consistent tendency for children in higher socioeconomic groups to receive higher scores.

Correlation coefficients were obtained between scores and such intelligence-test data as were available in the twelve-year group. The correlation between Kuhlmann-Anderson I.Q. and total score for Form I (45 cases) was .265, P.E., .091; for Form II (44 cases), .129, P.E., .100; and for the total of the two forms (44 cases), .182, P.E., .098.

Peterson (4), studying the ability of children to generalize the principle of the lever, found that schooling was more closely related to this ability than was intelligence or chronological age, and concluded that schools seem to give a type of training which is general in its effect upon this specific ability. This finding bears upon the question of the relation between maturation and experience as they affect causal thinking.

In the present study, the mean score for children of the given age in every grade was determined and the resultant mean divided by the number of items in the form to find the mean score per item. The findings for children age twelve and for all ages are shown in Fig. 2. Because of the small number of cases in certain grades, these means are not highly reliable. There is, however, a fairly consistent tendency for the mean quantified score to increase with school grade, age being held constant. This may be due in part to the selective distribution of children in the grades (the more intelligent children tend to be in higher grades), though the relation to intelligence has been shown to be negligible; or it may be due to actual training, the children in higher grades having had more instruction along lines which influence their answers. The rapid rise after grade 6 may be explained by the fact that the majority of seventh- and eighth-grade children were in the junior high school, where general science was part of the curriculum. The phenomena in Form II are particularly likely to receive attention in such a course. This may explain the difference between Forms I and II in the grade-score relationship. The higher relationship of quantified scores to school grade than to age and the low relationship between quantified scores and intelligence and socioeconomic status suggest that training or experience, as acquired through the schools, outweighs intelligence or innate maturational factors in determining the ability of children to answer the questions of this test.

Rating Using Piaget's Classification

Method Used in Evaluation of Ratings.—The author attempted to classify the answers according to the classification of Piaget (5), which includes the following 17 types of causal thought: motivational causality, finalism, phenomenistic causality, participation, magical causality, moral causality, artificialistic causality, animistic causality, dynamic causality, reaction of surrounding medium, mechanical causality, causality by generation, substantial identification, schemas of condensation and rarefaction, atomistic composition, spatial explanation, and explanation by logical deduction.

It soon became obvious that the task was too difficult and too much a matter of judgment to be left to one person, and this led the investigator to seek the help of other raters. Two professors in the Institute of Child Welfare, both interested in and familiar with Piaget's work, cooperated with the author in obtaining three independent classifications of the answers.

Piaget's published explanations of his 17 types of causal thought were found to be inadequate to permit an understanding of their nature. The best definitions given in his discussions were abstracted, however, with examples, whenever given. Each rater was provided with a set of definitions. Five of the definitions are given below:

Phenomenistic Causality.—Two facts given together in perception, such that no relation subsists between them except that of contiguity in time and space. Pebble sinks to bottom of water because it is white. No concept of relations.

Animistic Causality.—An internal biological tendency that is both alive and conscious. Clouds move because they are alive.

Dynamic Causality.—Animism gone, but still sees in objects forces that are capable of explaining their activity and movements.

Mechanical Causality.—Explanation by contact and transference of movement. No internal force at all. Wind pushes the clouds. Pedals make bicycle go.

Explanation by Logical Deduction.—Explanation by the principle of sufficient reason. Water flows into the second of the connected tubes because water can go equally well in both directions. Uses concepts of density, specific weight, etc.

There was much disagreement among the raters. Where there were three separate ratings of the questions (510 cases), it was found that all three agreed on 108, or 21.76 per cent of the items; two ratings agreed on 245, or 48.04 per cent of the items. The raters reported a great deal of difficulty in making decisions while classifying the answers.

The extent of the disagreement between the raters in the classification suggests three criticisms of Piaget's schema of classification: (*a*) His classification of causal thought into these 17 types is inadequate in that the answers given by a large sample of children do not fall into these types. (*b*) Certain of his types of causal thought are specific to a certain kind of question and do not deserve a special category, *i.e.*, no answers were found which could be classified as schemas of condensation and rarefaction, while mechanical causality included such a large proportion of the cases that it was too inclusive to be useful. (*c*) The degree of disagreement found between three trained raters suggests that individual judgment enters into the classification to a great extent. It becomes impossible, therefore, to put much reliance upon such a classification, particularly when it is based upon the judgment of one person.

In spite of the initial disagreement in classification, it was felt that a workable and useful classification using this schema of Piaget's was possible. In conference, the three raters attempted to reconcile their differences in judgment and arrive at the best classification for each answer. Many differences disappeared upon reconsideration. Misunderstandings of the definitions were cleared up and different interpretations of answers were reconciled. The result was a complete classification of all answers into Piaget's 17 types of causal thought, plus one new category, called "trickery," in which the child implies that there is some trick in the experiment. The frequency of this category was very small.

Analysis by Question and Form.—Great variation from question to question in the percentage of answers falling into each type of causal thought was found. For example, logical deduction comprised 83.1 per cent of the answers given to No. 1 of Form I but only 2.5 per cent of the answers given to No. 2 of Form I. This is probably due to the varying nature and difficulty of the questions.

None of the answers were classified under the following types: participation; artificialistic causality; reaction of surrounding medium; schemas of condensation and rarefaction; and atomistic composition. The absence of answers of these types is undoubtedly explained by the kind of questions used. Schemas of condensation and rarefaction and atomistic composition are both narrow classifications, applicable to a very few kinds of phenomena, none of which are found in this investigation. These types seem to be unnecessary subdivisions of larger and more useful categories.

Table 1.—Percentage of All Answers Falling into Several Piaget Classifications, According to Age

Type of causality	Age, years								
	8	9	10	11	12	13	14	15–16	All ages
1. Motivational	0.3	0.5	0.3	0.5	0.4	0.4	0.3	0.4	0.3
2. Finalistic	0.0	0.5	0.7	0.5	0.3	0.3	0.4	0.2	0.3
3. Phenomenistic	37.3	32.5	29.5	22.4	16.1	11.9	12.4	10.3	20.8
4. Participative	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5. Magical	1.6	2.6	1.3	1.0	1.0	0.5	0.3	0.2	1.1
6. Moral	1.2	0.5	1.4	0.9	0.6	0.8	1.1	1.0	0.9
7. Artificialistic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8. Animistic	0.6	0.2	0.6	0.3	0.3	0.2	0.0	0.0	0.3
9. Dynamic	8.3	5.8	6.3	6.2	7.1	6.7	2.9	5.7	6.3
10. Surrounding medium	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11. Mechanical	32.5	33.2	37.4	40.5	41.1	41.0	39.5	42.9	38.9
12. Generative	0.3	0.8	0.8	0.2	0.5	0.3	0.3	0.2	0.4
13. Substantial identification	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.0	0.1
14. Condensation, rarefaction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15. Atomistic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16. Spatial	0.0	0.0	0.0	0.1	0.0	0.2	0.1	0.0	0.1
17. Logical	10.7	11.8	14.1	19.8	28.1	32.0	35.6	31.6	23.4
18. Trickery*	0.6	0.7	0.5	0.0	0.0	0.1	0.0	0.1	0.2

* Classification added by the present investigator.

An inspection of Table 1 shows that there are but four types of causal thought that are represented by relatively high percentages: phenomenistic causality, 20.8 per cent, found on all questions; dynamic causality, 6.3 per cent, found on nine questions; mechanical causality, 38.9 per cent, found on all questions; logical deduction, 23.4 per cent, found on all questions.

Age, Sex, and Socioeconomic Trends. Figure 3 presents the percentage of all answers on Forms I and II falling within five classifications, according to age and to sex. These were the only types found in large enough frequencies to allow for further analysis.

The most striking changes with age are found in the phenomenistic, mechanical, and logical deduction categories. Phenomenistic answers decrease from 37.3 per cent of the answers at age eight to 10.3 per cent at age fifteen to sixteen. Answers of the mechanical type increase from 32.5 per cent at eight years to 42.9 per cent at fifteen to sixteen years. A striking increase is found in logical deduction, from 10.7 per cent at eight years to 31.6 per cent at fifteen to sixteen, with a peak at fourteen years of 35.6 per cent. Little age change is found in other types of causal thinking.

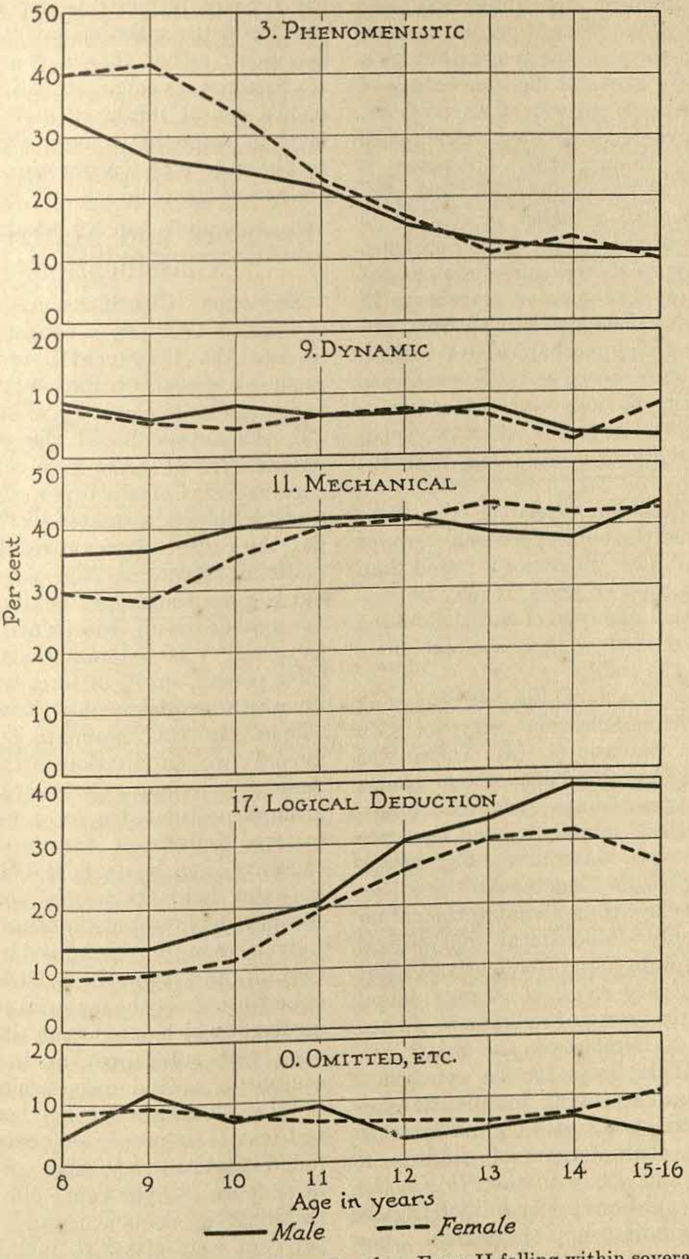

FIG. 3.—Percentage of all answers on Form I and on Form II falling within several Piaget classifications, according to age and sex. (*Courtesy of University of Minnesota Press.*)

The greatest sex differences are found in these same types of answers. On each form it was found that girls at all ages give a higher percentage of phenomenistic answers than do boys. Boys give slightly more mechanical answers, though this difference is reversed at the upper ages. Boys consistently give a higher percentage of answers of the logical-deduction type. Other types showed no consistent sex difference. The greater percentage of girls giving phenomenistic answers, and of boys giving mechanical and logical-deduction answers, is in line with the superiority of boys over girls in quantified scores, since the latter two types have far higher score values than the former.

The differences between the three upper and three lower economic groups are small. Less difference is found than between the two sexes. It may be concluded that the type of causal thinking is not related to the socioeconomic level of the child.

The analysis of the ratings using Piaget's classification suggests two further conclusions: (*a*) There was great overlapping between age groups in the types of answers found. Finalistic, magical, moralistic, and dynamic answers were found at the highest age levels, though Piaget calls these prelogical types, to be found in the earlier years only. Mechanical and logical answers were found frequently at eight years. Every type of answer found frequently enough to eliminate chance factors is found over the entire age range. This leads to the conclusion that causal reasoning does not develop in definite stages with certain types of thought characteristic of children of one age and not of another. (*b*) On the various questions we find different percentages falling into the several types of response. Some questions elicit high percentages of mechanical and logical answers, others low percentages; some elicit more dynamic, some more magical answers, etc. This suggests that the type of response is dependent in part upon the question involved; that specificity rather than a general level of response is characteristic of the child's causal thinking; and that the level of response is determined more by the nature of the question than by the age of the child.

Sequence and Materialistic Classifications

Sequence Classification.—Analysis of Piaget's 17 types of causal thinking revealed that the types fell into definite groups or sequences. Rather than using logical and prelogical types as Piaget did, the author based the sequences on the *type of agent* involved in the explanation. Certain types of explanations involved a materialistic cause, *i.e.*, the cause was some reaction of a material substance (the candle goes out because the oxygen is all used up). In another group, the principal cause as given was nonmaterialistic, *i.e.*, some person, spirit, or force was called upon to explain the materialistic change. In this nonmaterialistic sequence two subdivisions were immediately apparent. Certain types of answers postulated a force *within* the material substance (as in dynamic causality, *i.e.*, boats float because air in water holds them up), or a personality (as in animistic causality, *i.e.*, water rises in tube because it is strong). Certain other types postulated a force or person *outside* the material substance involved, which acted from the outside upon this substance (as in magical causality, *i.e.*, God makes the rainbow).

When all the answers had been classified into their proper sequence, it was found that a very high percentage of answers (83 per cent) fell into the materialistic sequence, and but 10 per cent were classified into the nonmaterialistic sequence. There was little age change in the percentage falling into each classification, and sex differences and socioeconomic differences were found to be insignificant.

Of the eight types of causality which were included in the materialistic classification, only three types appeared frequently. These were phenomenistic causality, mechanical causality, and logical deduction. A classification which includes 83 per cent of the cases in three categories and leaves only about 10 per cent to be divided among the ten categories classified as nonmaterialistic is very unanalytical.

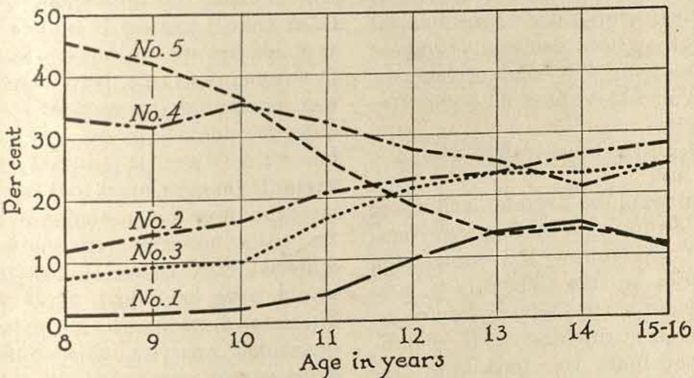

FIG. 4.—Percentage of all answers on Forms I and II combined falling into the several subdivisions of the materialistic sequence, according to age. For interpretation of the subdivisions see below. (*Courtesy of University of Minnesota Press.*)

Materialistic Sequence.—Since it is reasonable to suppose that there is improvement with age, even in materialistic answers, the materialistic classification was subdivided in an attempt to get a more analytical classification. This subdivision was made on the basis of the completeness of the mechanical explanation as well as the recognition of the principles involved. The definitions of the five subdivisions of the materialistic sequence are as follows:

1. Fairly complete mechanical explanation with induction of the principles involved. Correct cause-and-effect relation, with generalization of principles. Example: Need bigger block on one end of the teeter-totter because one side is longer and heavier than the other.
2. Fairly complete mechanical explanation without recognition of principles involved. Cause-and-effect relation presented without explanation of principles governing this relationship. Example: Need bigger block because one side is heavier than the other.
3. Mention of principles involved in the phenomena, without tying these up to the actual mechanical explanation. Example: Need bigger block so two sides will balance or weigh the same.
4. Incomplete mechanical explanation, with no recognition of principles involved or indication of the causal relationship. Appeal to mechanical causes with no concept of what the cause-and-effect relationship is. Example: Need bigger block because the board is not even.
5. Phenomenalism, in which the facts are given together in perception, but no cause-and-effect relation is given or any principle to explain the relationship. Example: Need bigger block because one end is farther down.

By using this classification we hoped to discover the nature of the improvement that takes place after the child has reached the stage of development at which he gives materialistic answers. Figure 4 presents, according to the age of the children, the percentage of answers falling into each of these subdivisions. There is a marked age change in the type of materialistic answer given. The percentage of answers of the phenomenistic type decreases from approximately 45 per cent at age eight to slightly more than 10 per cent at ages fifteen to sixteen. There is a great though less striking decrease in the percentage of answers of the fourth type. Type 3 increases from about 8 to 25 per cent. Type 2 increases regularly from 12 to about 18 per cent. The first type of explanation increases with age from about 2 per cent to 11 per cent at fifteen to sixteen years, with a peak of 16 per cent at fourteen years. The marked age changes are evidence that, after materialistic or mechanical reasoning has been achieved, progress is still made in the kind or level of reasoning of which the child is capable.

Interpretation of Findings

Evaluation of the Testing Technique. The technique used in this investigation, that of presenting the experiments to children in the schoolroom and having them write their explanations, proved highly satisfactory. It is difficult to evaluate the technique statistically, for the usual methods of determining reliability and validity are not applicable. The reliability coefficients (odd-even) are high, however, when it is considered that this is not a standardized test and every item differs greatly from every other item. The same is true of the coefficients relating one form to the other.

Several lines of evidence indicate the validity of the measure. Comparison of the answers given by these children with answers given by other children under widely different circumstances impresses one with the similarity. Whether answers are elicited by the individual or by the group-testing method, in one country or in another, seems not to affect the form in which the children give their answers, the frequency with which certain answers are found in comparison with others, or the variety of answers. The fact that the motivation was excellent in the group testing eliminates one possible criticism. Perhaps the best validation of the technique lies in the fact that, when the quantified ratings given these answers are analyzed, group differences, a definite age progress in the value of answers, and sex differences are found. If the method were not adequate, it is unlikely that the expected age and sex relationships would be found.

There is one distinct advantage of this group-testing technique over the use of the multiple-choice method. Each child's answer is retained intact and answers are not forced into four or five categories. In this investigation it was found that the answers to a single question could not be grouped into fewer than from 16 to 35 typical answers. If these answers had been forced into the four most common alternatives, the individual explanations that differed from those of the majority would have been lost. Since we were interested in a qualitative as well as a quantified analysis, this would have defeated our purpose at the outset.

Another advantage of the group testing is that it permits testing a large number of children, making possible statistical analysis of the findings and control of the sample. The argument might be used that this method does not probe the depths of the child's understanding and that it accepts the first ready answer of the child as representing his best causal thinking. This, of course, is a possible criticism. Yet the clinical method likewise has disadvantages. When reading accounts of many individual interviews, in which one question follows another and the child is pressed to explain what he means by each statement, one gets the impression that the children are being driven to the wall and that, because they feel obliged to answer the questions, they invent an answer which will help them out of their difficulty. In some cases the clinical method may make more clear the completeness of the child's understanding, but in others it undoubtedly encourages guesswork and flights of fancy.

Piaget's Classification of Types of Causal Thinking.—Piaget's classification of children's thinking into 17 types was valuable as a pioneer attempt to analyze causal thinking and directed attention toward the qualitative aspects of children's explanations. Because this classification has stimulated research into the nature of children's explanations, it has been valuable. The present investigation, however, has brought to light inadequacies and criticisms of the classification which suggest that it is no longer very useful as an instrument for studying children's thinking.

A criticism of this classification that has been recognized by all students of the problem is that, when children's explanations are classified into finalistic, moralistic, and animistic types, the child's world is being interpreted in terms of the adult conception, and philosophical and logical implications are being read into the child's thoughts which may not be there at all.

Stages in the Development of Causal Reasoning.—Throughout his discussion, Piaget implies that the development of causal thinking takes place by stages: the first stage including explanations of a phenomenistic, finalistic, magical nature; the second including artificialistic, animistic, and dynamic explanations; and the third, the more truly causal explanations, completing the process of evolution (at age eleven or twelve). Furthermore, the answers to each specific question of causality as "What makes boats float?" and "Why does the penny stay in the box?" show stages in development that are characteristic of children of certain ages.

All evidence in the present study points against the validity of classifying causal reasoning into stages. In every type of qualitative analysis the outstanding finding was the great amount of overlapping. Most types of answers were found over the entire age range and no kind of answer was found at but a single age (except where the frequency was a fraction of 1 per cent). Nor were the answers of children of a given age classifiable into a single type. The age changes in percentage of certain types of answers were gradual and in many cases negligible. It is impossible to say that certain types of answers are characteristic of children of certain ages, as distinguished from other types of answers characterizing children of other ages. Causal thinking apparently does not develop by stages but by a gradual process.

Specificity in Causal Thinking.—Although Piaget does not express the opinion in so many words, the impression given by his writings is that causal thinking is conceived as a general ability, that a child's thinking in general has reached a certain stage of development, and that his answers to all questions of causality involve reasoning of a single type or level. There is no evidence in the present study to support this interpretation. Two types of statistical analysis point to the opposite conclusion. The first evidence is in the low odd-even and form-versus-form reliability coefficients. If a child has reached a certain *stage* in the development of causal thinking, his answers to different questions should all be on the same quantitative level and the correlation of odd and even items should be high. The second evidence is the striking difference between the findings on the various questions. There is a wide range in percentage of answers to different questions that fall within the several Piaget types. Certain questions elicit 100 per cent materialistic answers, others a small percentage. The content of the question appears to influence directly the kind of answer given. It seems evident that there is no general ability to reason causally, but rather that causal explanations are specific to the problem.

Influence of Training on Causal Reasoning.—Piaget's concept of maturation (expressed in terms of the "structure" of the child's mind at different ages) has been criticized in that he attributes to maturation certain phenomena that can be shown to be related to experience. Evidence presented by this study suggests that training, such as is given in the public schools, is an important factor in determining the causal explanations of children. The relationship between quantified scores and such factors as intelligence and socioeconomic status was very low within a single age group, whereas the relationship between quantified scores and school grade was considerably higher. The answers to these questions are more directly determined by factors involved in school experience than they are by intelligence or socioeconomic status. Undoubtedly maturation and innate factors have a delimiting effect on causal thinking, but the answers to specific questions are more closely related to school experience and whatever that implies in the way of direct or indirect instruction and training.

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CHAPTER IX

GROWTH IN INTELLECTUAL ABILITY*

FRANK N. FREEMAN AND CHARLES D. FLORY

The General Problem

The question of intellectual growth and development is one on which psychologists and educators have formulated conclusions of far-reaching practical importance. Owing to the inadequacy of the data on which these conclusions are based, however, they are conflicting on some significant points, and the majority opinion is in error on some points. This is a sweeping statement, which, of course, must be supported by detailed and exact evidence.

Before presenting the evidence in detail we may specify some of the problems of intellectual growth on which conclusions have been drawn. By intellectual growth we mean growth in general ability, *i.e.*, the ability which is measured by our so-called "intelligence test." We shall not enter upon an extended discussion of the nature of such general ability or of the question regarding the relative contribution of nature and nurture to such ability. Our tests measure general intelligence to the same extent as do the best of the tests which use language as their medium, and they measure native capacity on the one hand or education on the other to the same extent as do the better tests.

One of the outstanding questions regarding intellectual growth concerns its terminus. This question is couched in various forms. It is sometimes expressed as the mental age of adults and sometimes as the age at which intellectual maturity is reached. It is obvious that these two terms mean the same thing. The average mental age of adults is the average age at which persons cease to increase in intellectual ability. This age has been set all the way from thirteen and one-half to some age in the twenties. Prevailing opinion among psychologists, following the report on the Army tests, has put the age early. Clearly this is an issue of considerable import to education and even to democracy in general.

A second question, which is also significant though its practical bearings are not quite so obvious as the question of the terminus of growth, is that of the form of the growth curve. This question deals with the changes in rate of growth at successive ages or periods of development. It has to do both with broad contrasts between the larger divisions of childhood or youth and with shorter periods of spurt or slowing down in growth. If, as some believe, growth during later adolescence is so slow as to be almost imperceptible, this fact would have almost the same practical implications as would complete cessation of growth at early adolescence.

A third general question, which involves a number of subordinate questions, concerns the relation of different individuals to each other in intellectual growth. We are here not dealing with the problem which goes familiarly by the term "constancy of the I.Q." This term, as it is ordinarily used, means the extent to which individuals keep their same relative position or same rank order when they are tested at successive ages. This is, of course, an important problem. But it has been investigated rather thoroughly by the statistical methods of correlation and of mean deviation. We know about how much agreement there is in the I.Q.'s of a group of individuals on successive tests, or conversely about how much change occurs, on the average. We also know the general fact that the change which takes place over a long period of five or six years is greater than that which occurs within a period of one or two years.

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* The complete report of this study is published in F. N. Freeman and Charles D. Flory, Growth in intellectual ability as measured by repeated tests. Society for Research in Child Development, Monographs, 1937, **2**, No. 2. Pp. xi + 116. Adapted with permission of the society.

Our methods do not offer any peculiar advantage in the study of this problem of the degree of constancy of the I.Q. They do, however, as we shall see, give the means for an analysis of the changes in the relative intelligence of different individuals. This analysis, dealing with the terminus, rate, and form of the growth curves of individuals, throws some light on their variations in relation to each other.

The variations in the terminus of growth curves of different individuals are as important as is the average terminus of growth curves of people as a whole. If one individual grows at the same rate as another but continues to advance to a later age he will reach a higher level in the end. The question is particularly important as it touches on the relation of degree of intelligence to the terminus of growth. If the more intelligent person continues to advance to a later age than the less intelligent person, as has commonly been supposed, he has a double advantage. If, on the other hand, the less intelligent person reaches intellectual maturity later than his more intelligent fellow, the duration of his growth compensates to some degree for his slow start. This question is not closed and it is one to which our method is fitted to contribute.

Differences in rate of growth are also of obvious importance. Two persons of the same ability at a given time may differ markedly in ability at a future time if their rates of growth are different. Again, if rates of growth differ, it is important to know whether there is any correspondence between degree of intelligence and rate of growth. The case is much the same as is that of the terminus of growth just mentioned.

Finally, there is the problem of the form of the growth curves of different individuals. Do some persons grow fast and then slow down, whereas others proceed at a more uniform pace throughout their growth period, or do all follow much the same pattern of growth? If a substantial difference in form occurs, does the form of the individual curve have any relation to the individual's level of intelligence? Besides asking these questions about the general form of the curve, we may raise the same questions about the lesser fluctuations in rate, such as may be characteristic of the early adolescent period.

These are the major problems with which we are to deal. It has already been implied that the methods usually employed in the study of mental growth are unsuited to give an unambiguous answer to the questions which have been raised. The limitations of the common method may be pointed out more explicitly. /The customary method of studying mental growth is the cross-section method. By this method mental tests are given to different groups of children at different ages. A growth curve is then constructed by finding and plotting the averages of the successive age groups and then joining the points to make a curve. To supplement this general or average curve different portions of each age group may be segregated and averaged. Again, measures of variability may be found.

This method has the difficulties which inhere in the cross-section method as well as those which inhere in the mass method. The fundamental difficulty with the cross-section method as distinguished from the mass method is that, since different children are tested at successive ages, it is impossible to be sure that the selection of cases at each successive age is a similar sample of the population as that at the other ages. In fact, we may go farther and say that it is pretty certain that the successive age groups are not similar samples of the population. This introduces a substantial and indeterminate error at the outset.

The cross-section method must also, in the nature of the case, be a mass method, *i.e.*, groups of persons and not single persons must be used. This introduces other limitations, and limitations which it is powerless to overcome, in contrast to the longitudinal method. The fundamental difficulty may be expressed by saying that the individual, or even a special class of individuals, if there be such, is lost in the mass. For instance, suppose a small group of individuals started to grow more rapidly at, say, ten years of age, while the rest continued at the same pace as before. This would produce but a slight rise in the average curve. If an additional group started to accelerate at eleven and another at twelve the average curve would continue to grow steeper, but the average curve would change more gradually than would the curves of individuals. In the same way the average curve would slow down more gradually than would the curve of individuals. Take another example. Suppose we wish to determine whether superior individuals follow a different course of development from those of lesser ability. Our only means of studying this question is to separate the upper portion of each age group and average them separately. But since the groups at successive ages are not the same individuals we do not know whether averages are the same as they would be if the individuals were the same. In other words, we cannot say that the curve which is made by joining the plots of these averages really represents the growth of any person or group of persons.

The defects of the mass cross-sectional method have led to a few studies by means of repeated tests of the same individuals. This may be called the "longitudinal method." The success of this method in the study of physical growth justifies the expectation that it will be valuable in the study of mental growth.

Certain longitudinal studies of physical growth could be made more rapidly than could corresponding studies of mental growth, because the program of physical examinations of a few private schools yielded repeated measures on the same individuals, while no corresponding mental records existed. It was, therefore, necessary to set up a long-time program of repeated mental tests. This was done in the University of Chicago Elementary School in 1921. The tests on which the present monograph is based were continued without essential modification for ten consecutive years. The tests were made on or near the birthday, and the tests of a given child were continued as long as he remained in either the Elementary School or the High School. A few individuals were tested in college.

The Method

The method consists in testing the same children at yearly intervals on or near their birthdays by the same test. This is the longitudinal, as contrasted with the cross-section, method. It avoids the difficulties, inherent in the cross-section method, of a possible difference in sampling at different ages and of the submergence of individual differences in development in an average. It yields a picture of individual vagaries of growth and also a true average of any group whose curves it may be useful to combine.

The Tests.—Four tests were used in this study, a vocabulary, analogies, completion, and opposites test. The battery is called VACO for short. Each test was given individually and consisted of items ranging from easy to difficult. They were administered during the first three years on two different days to avoid fatigue. After the program was reduced in 1925, the four tests used in this study have been given at one sitting. The VACO tests have been given, from the first, on or very near the child's birthday. Each subject was scheduled, as far as possible, within a week of his birthday. It has been the policy to consider a range of plus and minus 15 days as sufficiently within the limits of error to be included.

The time required to take the four tests varied markedly with different subjects. The most rapid workers finished the VACO tests in slightly more than 30 min., while the slowest pupils required as much as 2 hr. to complete the four tests. Time or speed has not been considered as a factor in interpreting the results. Each pupil was allowed sufficient time to respond to all the items. The examiner by means of a stop watch determined the items which were not responded to within a limit of 10 sec. The responses were recorded, although the pupil consumed an indefinite amount of time. After the time element was eliminated from the administration of the tests the early scores were corrected to make them comparable with the later results. Such a correction was quite simple, since all responses had been carefully recorded from the beginning. The younger children could not respond to all the items in the tests. They were urged to go as far as possible with an attempted response. The scores of the different tests were, for most purposes, combined into a composite score.

The items of each test were chosen from a series of items previously standardized or scaled by an earlier investigator, the vocabulary test by Terman (5), the analogies test by Pintner and Renshaw (4), the completion test by Trabue (3), and the opposites test by Greene (2). The evenness of the scaling of the composite score was examined by Thorndike's method of changing point scores to values expressed in equal units (6). The two correspond closely, indicating that the point scores on the composite are not significantly different from the values derived by changing the total scores into a scale of equal units.

The reliability of the composite score as found by correlating the scores of a group of pupils at an age with their score a year later varied from .823 to .886 for the different groups. Considering that a year interval intervened, this is reasonably good and indicates that group comparisons may be made with assurance. The reliability coefficients are higher than those found for the Stanford-Binet scale and the Otis Self-administering Test in the case of the same subjects, which were .64 and .79 respectively.

The correlation of the scores on the VACO test and the Binet test is .70 and when corrected for attenuation, .94. The correlation with the Otis test is .60 and .67 in two groups and when corrected for attenuation, .73 and .84 respectively. These correlations are low, but they are higher than the correlation of the Binet with the Otis with the same subjects, which was only .51. The VACO tests are therefore more reliable than either the Binet or the Otis tests, as administered in this school, and they correlate more closely with either the Binet or the Otis than these tests correlate with each other.

At the beginning three forms of each test were prepared so that the forms could be rotated to avoid the practice effect that might arise from repeating the same items after an interval of one year. After this program had been carried on for four years a study of the records indicated that the practice effect was slight. This conclusion was confirmed later by comparing the curves of progress of those who had taken the test on successive years with the composite curve which included at each age those who took the test for the first time, second time, etc.

The Interpretation of Scores.—The curves of growth in this study are based on actual scores rather than on absolute scaling. By absolute scaling is meant determining the difficulty of the items of a test in terms of the per cent of persons who pass them and selecting items which are, as far as possible, equally spaced in difficulty. Absolute scaling cannot compensate for gradual shifts in scale values extending throughout a large part or all of the scale. Such shifts can probably be avoided in a point scale by using many units and fine units of measurement. Minor shifts can be detected by comparison of the distribution of raw scores of an age group with the normal distribution. The attempt was made by scaling the items of the test to secure a test with equal intervals; and a comparison of the distribution of scores with a theoretical normal distribution indicates that this attempt was successful in avoiding systematic errors and, in addition, large errors of the random type.

The chief technical question concerning the test, which has an important bearing on the interpretation of the results, is whether it sets an artificial upper limit to the scores. A test has an upper limit or artificial ceiling if it does not have items of sufficient difficulty to discriminate the ability of the ablest members of the group which is being tested. This reduces the extent of the distribution of scores at the upper end. The decrease in variability in the scores of the later adolescent age groups, which is contrary to nearly all earlier studies, might lead one to infer that the test is defective in this respect. This test, like all tests, does, of course, have an upper limit. It does not appear, however, that this upper limit produces the decrease in variability which has been mentioned, or otherwise seriously distorts the results, for the following reasons. (*a*) The test is fully as extended at the upper end as other tests which are commonly used and by the use of which a continued increase in variability has been found. The difference would then seem to be due to the difference between the longitudinal and cross-section methods rather than to the nature of the test. (*b*) A specially constructed analogies test to secure greater range at the upper end did not secure significantly different results from those secured by the original test. (*c*) Tests at the college level yielded growth at an undiminished rate from middle adolescence to the ages nineteen or twenty. It hardly seems likely that this would have been true if the test were seriously limited at the upper end. However, the test may be limited to such a degree as to affect some of the findings, particularly those relating to variability, and further investigation with the aim of extending the range of the test at the upper end is desirable.

The findings and conclusions of the study are based primarily on continuous records of the same individuals. However, because many children were lost to the study during the 10 years of its life and some were added at the intermediate ages, and because it was found desirable for certain purposes to make up composite curves by putting together the records of children with incomplete series of scores, some of the curves used are of this composite character. In each case the composition of the curves is stated and an attempt is made to allow for any peculiarities which may be due to their make-up. The similarity between the composite curve and the curves made up exclusively of the same individuals throughout is shown by the comparisons between the curves of runs of various lengths and the composite curve.

The Results

The findings of the study bear chiefly on a few major problems, namely, the rate of growth at successive ages or periods, including its fluctuations, as expressed in the growth curve: the terminus of growth or the age at which it ceases or approaches zero in rate; individual and sex differences in these respects, including changes in variability at successive ages; and the relation between individual differences in level or degree of ability and differences in rate of growth or fluctuations in rate. The findings may be examined also with a view to discovering the factors in mental growth.

The General or Average Curve of Intellectual Growth.—The first problem is the general or average curve of growth, or the rate and fluctuations of growth at successive ages. It must, of course, be clearly understood that any general curve of growth is something of a mathematical fiction; it does not correspond to the growth of individual children. Nevertheless, it may be said to reveal general trends. The curve of children without distinction as to ability is shown for the ages from eight to seventeen in the composite curve (Fig. 1), and for the later teens in the curve of 26 individuals tested from years nine to nineteen inclusive (Fig. 2).

These curves severally and jointly show: (*a*) a slight acceleration in preadolescence; (*b*) a moderate decline in rate of growth beginning in early adolescence; and (*c*) a continuance with very little further decline in rate to the end of the adolescent period, or nineteen or twenty years. The two features which contrast most markedly with those of previous studies are the small amount of the decline in early adolescence and the continuance with so little further decline to the end of the teens. These characterizations, of course, apply to the average curve. Curves of individuals or of groups classified according to ability exhibit variation from the average.

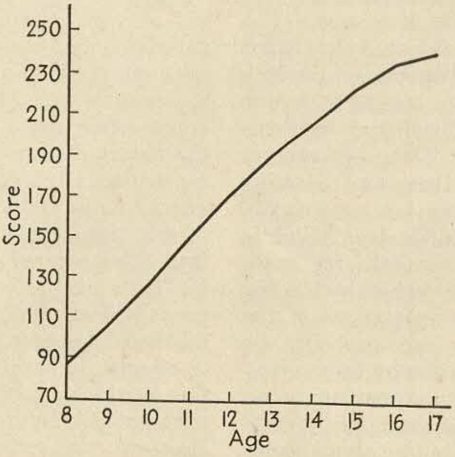

FIG. 1.—The composite curve of all subjects drawn from the mean score for each age. (*From Monogr. Soc. Res. Child Develm.*, 1937, **2**, *No.* 2, *p.* 29.)

The Age of Intellectual Maturity.—The terminus of growth could not be determined in this study for the reason that an increase in ability was manifested up to and including the highest age studied. This fact justifies the statement that the age at which intellectual growth ceases, for the group taken as a whole, is not earlier than nineteen. This conclusion assumes that the group which attended college is representative of the whole group in this respect; there is no reason to think otherwise. We may reasonably go a step further and infer from the form of the growth curve that the terminal age is somewhat later than age nineteen, since the conclusion that intellectual growth culminates at this age would imply that it proceeds rather rapidly up to this point and then halts abruptly. Such a course is highly improbable. Doubtless the rate of growth declines gradually and the increase in ability continues several years beyond age nineteen.

Sex Differences.—On the combined score of the four tests sex differences appear to be negligible (Fig. 3). If we consider the tests separately the girls seem to have a slight advantage on the completion test and the boys on the vocabulary and possibly the analogies tests. Previous studies have suggested that girls are superior in abilities involving language. This would explain their superiority on the completion test but would seem contrary to the boys' superiority on the vocabulary and analogies tests. We have no explanation to offer for the apparent contradiction.

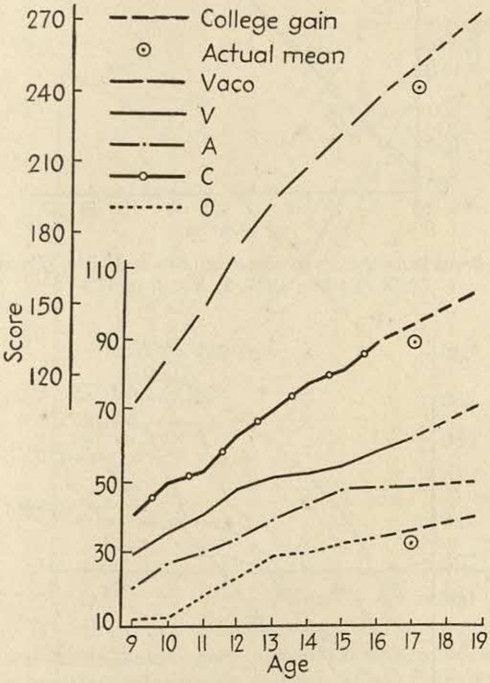

FIG. 2.—Composite curves of 26 students tested at the college level. (*From Monogr. Soc. Res. Child Develm.*, 1937, **2**, *No.* 2, *p.* 82.)

The equality of the sexes on the combined score contradicts the common judgment that the intellectual growth of the two sexes differs because of the difference in the rate of physiological development and of physical growth. This latter difference is well known. Girls reach their adolescent spurt about two years earlier than boys, so that they are actually somewhat taller and heavier at about ages eleven and twelve; and they reach the decline and cessation in growth correspondingly sooner, so that they fall progressively farther below boys in stature and weight in the middle teens.

It has sometimes been assumed that the intellectual growth curves of boys and girls differ in the same way as their physical growth curves. Our curves show clearly that such is not the case. There is, to be sure, a very slight suggestion of a superiority of girls at ages eleven to thirteen inclusive and of boys at ages fifteen to seventeen. It is possible, then, that diverse rates of physical growth of the two sexes have a slight influence on the rate of intellectual growth, but, if so, the influence of this factor is slight in comparison with other factors which produce a substantial equality in rate of intellectual growth.

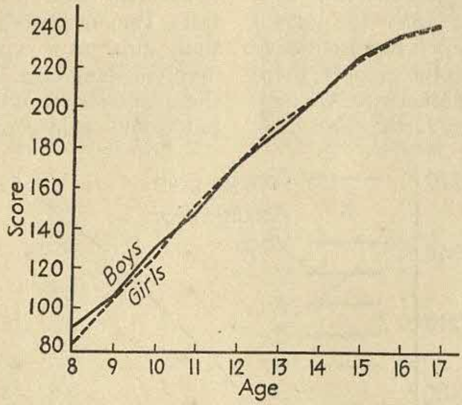

FIG. 3.—Composite curves from the mean scores of boys and girls. (*From Monogr. Soc. Res. Child Develm.*, 1937, **2**, *No.* 2, *p.* 44.)

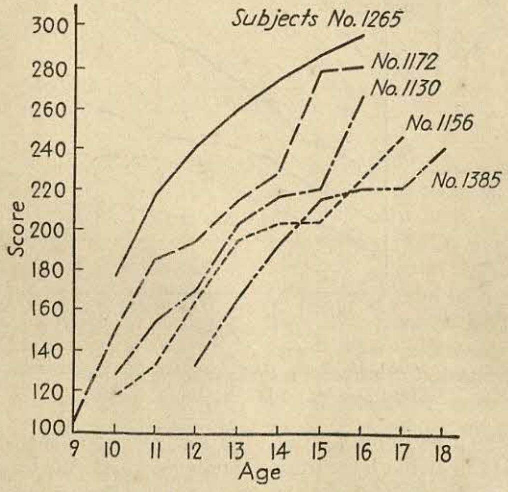

FIG. 4.—Some selected individual growth curves which suggest a negatively accelerated development of intellectual abilities. (*From Monogr. Soc. Res. Child Develm.*, 1937, **2**, *No.* 2, *p.* 60.)

Individual Differences.—Individual differences in the rate of intellectual growth, and especially in the fluctuations in rate and the form of the growth curve, loom very large (Figs. 4, 5, and 6). These differences cannot reasonably be ascribed wholly or even mainly to accidental causes, since many of them exhibit a consistency which rules out such an interpretation. They reveal real differences in intellectual development. Such differences place a limit on the accuracy of prediction of the intellectual growth of an individual, particularly over a long period of time. Prediction which is based on the assumed future development of an individual in accordance with a theoretical growth curve or even an actual average curve is bound to be subject to a large margin of error. The correlation between test scores on repeated tests has often been taken as justifying prediction within small limits of error; but when the interval between the tests is 5 to 10 years the correlation is so low as to indicate the existence of relatively large variations in individual rates of growth. The evidence from correlation, therefore, agrees with our findings.

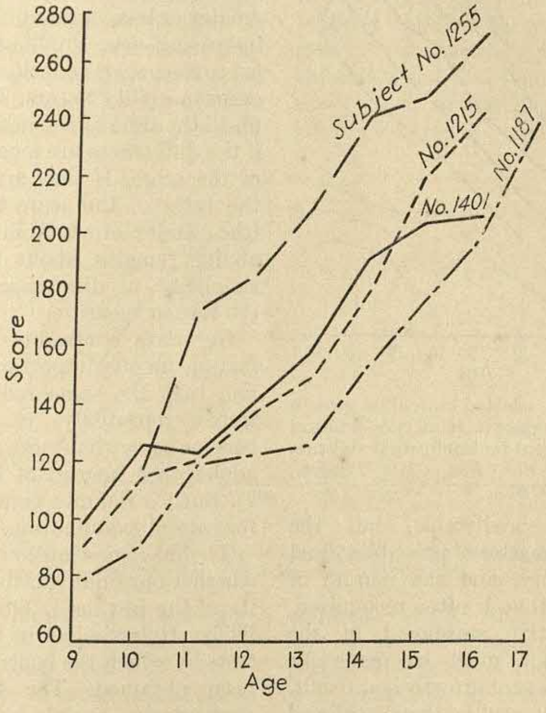

FIG. 5.—Some selected individual growth curves which suggest a positively accelerated development of intellectual abilities during at least a part of the growth period. (*From Monogr. Soc. Res. Child Develm.*, 1937, **2**, *No.* 2, *p.* 61.)

A comprehensive and accurate statement concerning the rate of intellectual growth of different individuals is necessarily a qualified statement. Neither the simple statement that the growth curves of different individuals resemble each other and that the growth of an individual is predictable nor the statement that the growth curves of different individuals are diverse and the growth of an individual is not predictable covers the case. It is a matter of degree. Growth curves do exhibit a certain degree of similarity, but by no means complete uniformity or even a close approach to it. The growth of an individual is predictable, but the prediction is a matter of probability and not of certainty, and the margin of error is larger than is often recognized.

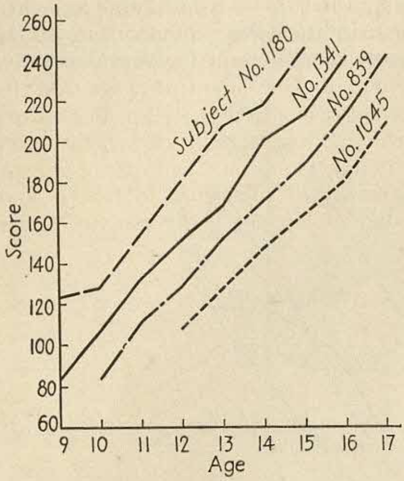

FIG. 6.—Some selected individual growth curves which suggest a relatively uniform rate of development for intellectual abilities. (*From Monogr. Soc. Res. Child Develm.*, 1937, **2**, *No.* 2, *p.* 61.)

A quantitative statement of the allowance which must be made for variation in mental growth is difficult, and up to the present has been achieved only with respect to restricted aspects of the case. For example, we know something of the limits of the average change in I.Q. to be expected upon repetition of a test. Under favorable circumstances and after a brief interval an average change of about five points has often been found. This, of course, means that about half the changes are more than five points. On the other hand, Terman found, for a group of gifted children after an interval of 6 years, an average change of 14 points. Such figures as these merely give a measure of the amount of change, on the average, to be expected after a specified length of time. They indicate that the magnitude of such change is considerable. The changes or variations in the form or fluctuations in the growth curve have not thus far been reduced to mathematical expression.

Changes in Variability.—Changes in variability indicate whether individual differences become, on the whole, greater or less, or remain the same with increasing age. Previous studies have led to the general conclusion that differences in ability become larger with age up to the time of intellectual maturity, if the differences are measured in terms of the score. If they are measured by the ratio of the score to the average (the "index of variability"), the variability remains about the same. For simplicity of discussion we shall use the former measure.

Our data contradict the prevailing finding in one important respect. We find that the same individuals, when tested repeatedly year after year, become somewhat more alike after mid-adolescence instead of less alike (Fig. 7). Such a definite contradiction calls for careful examination.

The first question to be considered is whether our finding is due to a peculiarity of the test used. This hardly seems likely. It is similar in content to the tests by which the contrary finding has been obtained. The test has been particularly examined to find out whether it is peculiarly limited at the upper end, with negative results. The parts of the test were chosen for the express purpose of measuring the higher mental processes, in which development may be expected to continue the longest. The test, therefore, does not appear to be responsible.

Another possibility to consider is that the reduction in variability is due to practice, since the test was repeated so often. This seems improbable for two reasons: (*a*) practice has more often been found to increase than to decrease variability; (*b*) it is not evident why practice should reduce variability at one age rather than at another.

The chief difference between our conditions and those of other studies is that we compared the same individuals year after year. Our findings are therefore free from error due to sampling. It does not seem probable that the continued increase in variability which has been found in studies by the cross-section method is due to a sampling error. In fact, this method would seem likely to produce a progressively restricted sampling which might be expected to yield the opposite result. We can only say that the elimination of the sampling error makes our finding more worthy of credence than those which are derived from cross-section studies; we are not able at present to explain the discrepancy.

Accepting our finding pending further investigation, it appears to mean that the youth who make the higher scores slow down in intellectual growth sooner than do those who make the lower scores. This hypothesis leads to a comparison of the intellectual growth of individuals of different levels of ability.

Growth at Different Levels of Ability. The study of variability is a somewhat indirect method of comparing the rate of growth of bright and dull children. The more direct method is to examine their curves of growth. Since individual differences make it difficult to generalize we are led to group children according to ability and to compare the average curves of the groups.

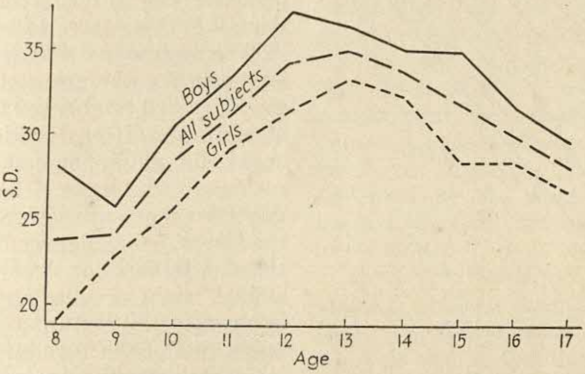

FIG. 7.—The variability in the VACO tests of all subjects and for boys and girls separately. (*From Monogr. Soc. Res. Child Develm.*, 1937, **2**, *No.* 2, *p.* 37.)

The curves for 122 children, all with continuous records from ages eleven to sixteen inclusive, divided into three approximately equal groups, are given in Fig. 8. The salient facts are that the brighter children show an accelerated rate of intellectual growth in later childhood and that their rate of growth slows down somewhat in middle and later adolescence, whereas the duller children exhibit an almost constant rate of growth throughout the entire period. The curve of the middle group is intermediate in form as it is in position.

In finding a greater rapidity of growth of the bright children from ages ten to twelve or thirteen we agree with previous studies. The contrast appears in the later years. In harmony with the decline in variability we find that the brighter children fail to keep up their superior rate of advancement. In brief, the prevailing view is that bright children develop more rapidly throughout the entire period of childhood and youth, whereas we find that they develop more rapidly only in preadolescence.

As in the case of variability, the slowing down of the curve of the bright children may be ascribed to the limitation of the test. If this is the cause it is hard to see why the results of other studies do not show the same phenomenon. The tests used in them are at least as limited as is ours.

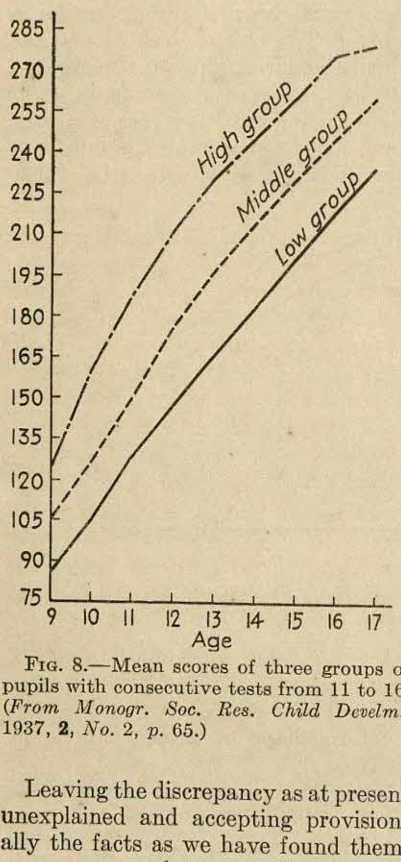

FIG. 8.—Mean scores of three groups of pupils with consecutive tests from 11 to 16. (*From Monogr. Soc. Res. Child Develm.*, 1937, **2**, *No.* 2, *p.* 65.)

Leaving the discrepancy as at present unexplained and accepting provisionally the facts as we have found them, we may speculate tentatively as to their meaning. Dr. Abernethy (1) has shown that there is a low positive correlation between bodily dimensions and scores on mental tests and that the correlation is highest at precisely the ages when we find the curves of brighter and duller children to diverge. Moreover, she finds that there is a correlation between precocity of maturing of sex and mental ability during the same ages, a finding which is partly confirmed in our study, but no correlation at all with adults, whose physical and mental maturity is relatively complete. These facts strongly suggest that there is some factor which affects alike rate of sex maturing, general physical growth, and intellectual development, and which manifests its effect chiefly during the preadolescent years. A factor which slightly deflects the course of development during these years would satisfy the conditions.

Such a factor might exist in the inherent nature of the organism, it might be an environmental factor, or it might be both. If the factor is inherent, there is nothing more to be said about it. The suggestion that it may be at least partly environmental arises from the fairly well established fact that age of maturing of sex functions is influenced by environmental conditions, such as food supply. The hypothesis might be that superior environmental conditions, being more commonly associated with superior than with inferior ability, might produce an acceleration in physiological maturing and that this might produce in turn an acceleration in mental growth. Against this hypothesis is the fact that Dr. Abernethy failed to establish a connection between acceleration in physical and mental maturing, and the difficulty in explaining why early physiological maturing would produce intellectual acceleration and later maturing not. Environmental influences may be responsible for the associated acceleration and earlier maturing of the brighter group, but the details of the relationship are not evident.

Whatever the explanation may be, the fact itself that the higher rate of mental growth of bright children is confined to the preadolescent period and that children of lesser ability advance in later adolescence with as great if not greater rapidity than bright children is of prime importance.

It should be kept in mind, of course, that our group of children of lesser ability is not dull in the usual sense of the word. Their I.Q.'s probably range from about 90 to 100. But they are relatively dull as compared with the rest of the school population. Whether the difference which obtains between the groups of different ability of our population would be found in a population which included a lower range of ability remains to be seen. But there is no more reason to think that they would not appear than that they would. The evidence from the comparison of I.Q.'s at different ages, which is frequently cited, throws no light at all on the problem, because I.Q.'s give no information on the form of the growth curve. The burden of proof is on the contention that the inclusion of children of lower ability would alter the picture.

To keep our conclusions strictly within our own findings, it appears that children of mediocre ability continue to advance intellectually during the period of later adolescence, as rapidly if not more rapidly than do bright children, and that they continue to advance to at least as late an age. In other words, children or youth of lesser promise may profit by continued education as much as if not more than their precocious and brighter comrades. If this is true, and we believe it is, it indicates that recent theories of development run the danger of doing serious injustice to children of mediocre ability by making too unfavorable prognosis of their attainment. Educational opportunity should be kept open to them into the college period if their interests and plans call for a continuance of education up to this period and if a suitable type of education can be provided. In advising students the course of their intellectual growth must be taken into account as well as their present intellectual ability; and the prediction of their intellectual growth must recognize the possibilities of growth at the lower levels as well as the variability of growth among individuals.

The Factors of Intellectual Growth

When evidence is presented that intellectual ability increases beyond early or middle adolescence the objection is sometimes made that the later increase is not true intellectual growth but the product of education. This is predicated on the fact that those whose education ceases in the early adolescent years do not continue to advance as do those whose education continues.

This objection implies a distinction between development due to organic growth or maturation and development due to education. It further implies that maturation is responsible for development up to a certain age and education beyond this age. And yet the two types of diverse development are measured by the same tests. These implications will not endure critical examination.

The fact is that there is no ground for making a sharp distinction between that part of intellectual development which is due to maturation and that part which is due to education on the basis of the evidence of our present tests, or perhaps of any tests we can devise. Certainly we are not justified in setting a certain age as the terminus of maturation. Nor are we justified in concluding that maturation is the sole factor before a certain age and education thereafter. Education is a factor from the beginning. Maturation is doubtless a decreasing factor, but we are not at present able to set its age limit.

It may be possible to determine more nearly the course of development due to the factor of maturation by determining the rapidity and limits of learning at successive ages. A genuine measure of learning may prove to be a better measure of the stage of maturation than is a single test. Experiments in learning at various ages are necessary to try out this hypothesis. Even measures of learning, however, will not be entirely free from the effects of education. We can only hope that they will be freer than are tests.

If we are able, by experiments with learning, to distinguish more clearly between the factors of maturation and education than we can do now, we shall be able to explain intellectual growth better and to appraise more exactly the effects of education. We shall still be justified, however, in considering intellectual growth to be broader than maturation. Intellectual growth is a composite effect of maturation and education. The one factor is no less fundamental or important than the other. If either were the more important it would be education, since this is the factor which is under our control.

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CHAPTER X

THE STANFORD BINET SCALES FOR MEASURING INTELLIGENCE*

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Maud A. Merrill

The first Stanford Revision of the Binet-Simon scale was published in 1916. Binet's 1908 scale consisted of 54 tests. The 1916 Stanford-Binet scale increased the number of tests to 90, but retained the essential features of Binet's method. This method for the measurement of intelligence, developed by Binet after years of painstaking research on problems of individual differences, has three essential characteristics: (*a*) the use of age standards of performance; (*b*) the measurement of the higher and more complex mental integrations rather than the simpler processes such as reaction time, rapidity of tapping, discrimination of tones and colors, etc.; and (*c*) the abandoning of attempts to measure memory, attention, sense discrimination, etc., as separate faculties, for a method based on the conception of intelligence as a combined functional activity of the various intellective processes, the sum total of those thought processes which consist in mental adaptation. Binet's conception of intelligence emphasizes the tendency of thought to take and maintain a definite direction, the capacity to make adaptations for the purpose of attaining a desired end, and the power of autocriticism. These three aspects of intelligence can be seen by examination of the individual tests of the scale to enter into the performance of the various tasks from the simplest to the most complex. In each test, which consists essentially of a problem situation to be solved, the child must keep in mind the end to be attained, must try different solutions under the influence of this directing idea, and must appraise the adequacy of each trial solution to meet the requirements of the task.

A scale which incorporates the essential characteristics of Binet's method is made up of an extended series of tests which present problems, success in which demands the exercise of intelligence. It includes tests which show, when tried out on unselected children, an increase in the percentage of passes from younger to older children. It includes tests which the bright children of a given age pass more frequently than children of the same age who on other grounds are known to be dull. The tests included are of many different kinds, some of them designed to reveal differences in memory, others differences in power to reason, ability to compare, power of comprehension, time orientation, facility in the use of number concepts, power to combine ideas into a meaningful whole, wealth of ideas, knowledge of common objects, etc.

By means of the Binet tests we judge the intelligence of a given individual by comparison with standards of intellectual performance for normal children of different ages. The tests are arranged in order of difficulty by age levels as found by trying them upon unselected children for the various ages from preschool to the high-school level.

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* The full report of these studies is published in Measuring intelligence. Boston: Houghton, 1937. Adapted with permission of Houghton Mifflin Company, publishers.

The 1916 Stanford-Binet revision was standardized on 905 subjects in California and Nevada. The guiding principle of the revision was to secure an arrangement of the tests and a standard of scoring which would cause the median mental age of the unselected children of each age group to coincide with the median chronological age; *i.e.*, the scale must cause the *average* child of five years to test exactly at five, the *average* child of six years to test at six, etc. On a scale so standardized the median intelligence quotient (ratio of mental age to chronological age multiplied by 100) will be 100 for unselected children of each age.

The tests were selected according to Binet's criteria. Tests that were included in the scale showed an increase in the per cent of unselected children passing from one age to the next. The validity of the tests was determined by checking each test against the scale as a whole, *i.e.*, the entire scale must be coherent. Thus, for example, a given test must be passed by a larger percentage of the ten-year-old children who, by the scale, have a mental age greater than 10, than by those ten-year-olds whose mental age on the scale is less than 10. A reasonably high degree of agreement with intelligence as judged by teachers and other observers and with school success was shown for the test as a whole.

Extensive use of this 1916 scale over a period of years brought to light certain defects which the newest revision, begun 10 years after the completion of the first, has undertaken to correct.

Essential Features of the Revision

The 1937 revision of the Stanford-Binet Intelligence Scale represents the fruits of a 10-year period of research. The revision utilizes, as did the original scale, the assumptions, methods, and principles of the age scale as conceived by Binet. It is essentially a standardized interview which calls forth from the subject his natural responses to a great variety of situations—a method which, to paraphrase an oft-quoted statement by Galton, attempts to obtain a general knowledge of the capacities of a subject by the sinking of shafts at critical points.

Although the original Stanford-Binet scale afforded a satisfactory measure over a fairly wide intermediate range, it was especially inadequate at both extremes. In order to meet this difficulty, the present revision contains tests at half-year intervals below the five-year level, the gaps which existed at years eleven and thirteen on the original scale have been filled, and the scale has been given more top by the addition of two supplementary superior adult levels. Not only has the number of tests been increased, but a richer sampling of abilities is made in the new revision.

Although subjective judgment of responses cannot be entirely eliminated from a test of the Binet type, it has been found that the instructions both for administration and for scoring of some of the tests of the original scale lacked precision. One of the aims of the revision has therefore been to secure greater objectivity of scoring. Definite principles and classified illustrations in evaluating responses have been given to guide the examiner. In many cases, test items have been rejected because of difficulty or subjectivity of scoring, in an attempt to bring the part played by subjective judgment in the scoring of responses as near as possible to the irreducible minimum.

Special attention has been given to the problem of securing a representative sampling of the white child population in the United States between ages two and eighteen for use in standardization of the scales. The number of subjects tested has been increased to 100 at each half-year level below six, to 200 at each age between six and fourteen, and to 100 at each age from fifteen to eighteen. A stubborn attempt has likewise been made to avoid sampling errors inherent in age, grade location, nationality, and geographical distribution. Although we do not flatter ourselves that we have been entirely successful, our data represent a much closer approximation to an unbiased sampling than has heretofore been attained in the standardization of any scale for individual examining.

One of the severest limitations to the usefulness of the original scale was the fact that no alternative form was available for use in retesting or as a safeguard against coaching. The 1937 revision provides two scales, designated as Form *L* and Form *M*, which differ almost completely in content but are mutually equivalent with respect to difficulty, range, reliability, and validity. Although Form *L* bears greater resemblance in content to the original Stanford-Binet scale, both, we believe, are relatively free from the grosser faults of the old scale.

Development and Standardization of the Scales

The process of constructing and standardizing a scale for the measurement of general intelligence involves five major steps: (*a*) the preliminary selection of tests; (*b*) their provisional tryout on a small group of subjects; (*c*) the selection of a representative group of subjects to be utilized as the standardization population; (*d*) the derivation of the final scales from the standardization data; and (*e*) the selection and application of units of measurement to express developmental level and brightness.

Preliminary Selection of Tests.—Work on the revision was begun with a survey of the literature on the old Stanford-Binet and a study of every kind of intelligence-test item that had been used or suggested. The search for suitable material yielded thousands of test items, some of them of unknown value and most of them of unknown difficulty. Preference was given, other things being equal, to types of test items that experience had shown to yield high correlations with acceptable criteria of intelligence. Such items were assembled in as great variety as possible. A large number of otherwise excellent tests had to be rejected because of such practical considerations as ease of scoring, appeal to the subject, time requirement, and convenience of administration. Prominent among tests which have universally proved their worth are analogies, opposites, comprehension, vocabulary, similarities and differences, verbal and pictorial completion, absurdities, drawing designs, memory for meaningful material and for digits.

After the mass of test items had been assembled and critically examined, the material which seemed to be the most promising was selected for experimental trial. This preliminary tryout was intended to effect the elimination of the least satisfactory tests and to give the approximate age location of those retained for further trial. It utilized about a thousand subjects in the vicinity of Stanford University for whom mental ages had been determined by the original Stanford-Binet scale. Curves of per cents passing at successive mental ages were plotted, and the steepness of these curves afforded a graphic indication of the validity of the tests. In preparation for the final tryout each test was given a provisional age location on the basis of these data.

It should be understood that the use of groups of known mental age for the first experimental trial of test items was largely a measure of economy. The final selection of tests and their standardization, as will be shown later, were based upon unselected populations and not upon mental-age groups as determined by any other scale. In the case of the preliminary tryout of items in the preschool range, mental-age groups were not available and chronological-age groups therefore had to be used. About 500 preschool subjects were utilized in this part of the tryout, obtained by consulting birth registration.

After this preliminary tryout had provided the necessary data for the selection of tests for the provisional scales, the further retention or rejection of items was based upon several criteria: validity, ease and objectivity of scoring, and such practical considerations as time economy, interest to the subject, and need for variety.

Validity of the items was judged by two criteria. The first one was increase in the per cent passing from one age to the next. Since a basic assumption of the age-scale method of measuring intelligence is that mental development increases with increasing age, it follows that an item which is passed by more eight-year-olds than seven-year-olds, and by more seven-year-olds than six-year-olds may be measuring general intelligence. The evidence for validity of an item presented by increase in per cents passing at successive chronological ages, however, is only indirect. Certain physical measures, such as height, increase with age but have little correlation with brightness. A more satisfactory criterion is increase in per cents passing by mental age, although reliance upon this technique predetermines that the scale based upon this criterion will measure approximately the same functions as that used in selecting the mental-age groups. Since the purpose of the revision was to provide scales closely comparable to the old with respect to mental abilities tested, this technique did not seem objectionable.

The second criterion of validity was a weight based on the ratio of the difference to the standard error of the difference between the mean age (or mental age) of subjects passing the test and of subjects failing it. The greater the magnitude of this ratio for a given test, the more sharply does that test differentiate between age groups. Since this measure is based upon the total number of successes and failures for the item in question and since it is a unitary index, it affords a better basis for judging the relative validity of items than does a series of per cents passing.

Formation and Use of the Provisional Scales.—When the sifting process described above had been completed, a sufficient number of promising tests remained to make up two provisional scales for final tryout. Provisional Form *L* contained 209 tests, and provisional Form *M*, 199. The number of tests in the completed scale is 129 in each form, only a small number of which are identical in the two forms.

The provisional scales were then applied to the more than 3,000 subjects upon whom the standardization was based, the testing in all cases covering a very comprehensive age range. The examination of each subject was extended downward through an age level in which there were no failures and upward through an age level in which there were no successes. All subjects included in the standardization data were given both forms of the test.

All the testing was done by seven thoroughly trained examiners of graduate status well grounded in the theory and practice of mental testing. Two months of intensive instruction and practice in the administration of the provisional scales preceded their use in the testing of subjects of the standardization group. Every effort was made to ensure that each test would be given, recorded, and scored as nearly as possible in the same way by all examiners. Recording of responses of the subjects was so complete as to permit later rescoring on more lenient or less lenient standards.

Selection of Subjects.—The importance of securing a representative group of school children to serve as subjects for the standardization of the tests cannot be overestimated. Strictly speaking, results of any research may be considered applicable only in situations or under conditions closely resembling those which obtained at the time of the original investigation. Generalization of results from a sample of the population to the general population is justified only if it can be shown that the sample is a true representative of the population as a whole. In the case of a scale for measuring general intelligence, applicability to the general American-born, white population is highly desirable for practical purposes. Hence, the avoidance of selective factors due to social and economic status in the standardization group becomes particularly significant.

Geographical Distribution.—Seventeen different communities in 11 states were sampled to secure the 3,184 subjects upon whom the final standardization was based. During the first year devoted to testing, three of the examiners worked in different communities in California, one in Nevada, one in New York, one in Colorado, and one in Kansas. During the second year testing was done in two communities in California, two in Virginia, one in Vermont, one in Texas, two in Minnesota, and in a number of rural communities in Indiana and Kentucky.

Socioeconomic Status.—Four estimates of the socioeconomic status of the subjects tested during the first year were made in an effort to appraise the group and to guide in the selection of next year's subjects. These were based upon the Sims Questionnaire, the Barr rating scale, the Taussig five-grade grouping, and a grouping arranged by Goodenough based on the census classification and affording a basis for comparison with the occupational distribution of employed males in the United States in 1930. Comparison with the census figures indicates that the rural sampling is still inadequate, despite special precautions to include additional rural communities during the second year. It is also apparent from the census figures that the distribution of subjects is slightly skewed in the direction of superiority of occupational status. This latter deviation from the census figures, however, probably represents a trend in the right direction, inasmuch as the census figures are for a younger, less occupationally stable group (employed males over ten years of age) and include Negroes, who represent on the whole a lower occupational group. (No Negroes are included in the standardization population.)

Selection of School Cases.—Schools of average social status were selected in each community. Then in each school our examiners tested all the children between the ages of six and fourteen who were within one month of a birthday in whatever grade enrolled. Our data include 200 such cases, 100 boys and 100 girls, at each age level from six to fourteen. The advanced group, aged fifteen to eighteen, presented the greatest difficulties of selection. The regular academic high school is highly selected, how highly depending on the nature of the community and on various other factors. The hundred cases tested at each of these upper age levels were selected with regard for the elimination of older students from the school systems.

Selection of Preschool Subjects.—In order to make sure that the preschool group was a continuation of the same distribution, we chose as far as possible younger siblings of the school groups. The chief sources through which these younger children were secured were: (*a*) birth records; (*b*) school census; (*c*) school siblings; (*d*) kindergartens; (*e*) well-baby clinics of city or county health centers; (*f*) day nurseries; (*g*) nursery schools conducted by settlement houses; and (*h*) personal report.

The extent to which these various sources were utilized in selecting cases necessarily differed widely from one community to another, depending upon the local conditions.

Nationality of Descent.—The subjects of our group were all American-born white children. In the case of the preschool group the parents also were American-born, but we made no effort to control the selection in regard to nationality of descent. In 50 per cent of the cases both parents were born in the United States.

Derivation of the Final Scales from the Standardization Data.—Before the arrangement of final scales could be made, it was necessary to check and rescore all the blanks. Although the seven examiners had scored the responses provisionally as the tests were given, it was inevitable that individual variations should occur in the application of the rules which had been laid down. In testing so many subjects, unexpected situations occur and types of responses are encountered which cannot be foreseen. The rescoring was all done at Stanford University; as it was done, lists of satisfactory and unsatisfactory responses were made up for each test item. The better part of a year was required to go through the more than 6,000 blanks in this way.

The primary tasks in arranging the final scales were then two: (*a*) elimination of the less satisfactory tests, and (*b*) the achievement of an age arrangement of the retained tests which would make the mean mental age of each age group of subjects identical with mean chronological age, giving a mean I.Q. as close as possible to 100. By means of Hollerith techniques, it was possible to plot for each test the curve showing per cent of subjects passing in successive ages throughout the range, also the curve of per cent passing by successive intervals of composite total score on the two forms. It was also possible to compute the correlation of each test with composite total score separately for each test, thus providing a basis for the eliminating of the least valid tests.

The "correct" standardization of an age scale depends, of course, upon the age location of the separate tests and upon the amount of credit (months of mental age) allowed for passing them. Other factors, such as the intercorrelation of the tests and the shapes of the curves of per cents passing, are also involved. It is at present not possible to lay down, in advance, rules which if followed will cause the scale to yield a mean I.Q. of 100 at each level. In the present revision, as in the original Stanford-Binet, it has been necessary to work empirically by revising and re-revising until an arrangement of the tests was formed which achieved the desired goal. In the case of Form *L*, six successive revisions were necessary to accomplish the result, but once this had been done for Form *L*, it was possible to achieve at once an equally good result with Form *M* by arranging its tests so as to match those of Form *L* at each age level with respect to difficulty, validity, and shape of curves of per cents passing by age. The standardization procedure involved not only the shifting about of tests in a given form, but also shifting them from one form to the other, modifying the standard of scoring to make a given test easier or harder so as to make it fit a given age level, etc.

Selection of Units of Measurement. The index of developmental level which has been used in the present revision, as in the first revision and in the original Binet scale, is mental age. The expression of a test result in terms of age norms is simple and unambiguous, resting upon no statistical assumptions. A test so scaled does not pretend to measure intelligence as linear distance is measured by the equal units of a foot rule, but tells us merely that the ability of a given subject corresponds to the average ability of children of such and such an age. This was all that Binet claimed to accomplish, and one can well doubt whether the voluminous output of psychometric literature since his day has enabled us to accomplish more.

There are certain characteristics of age scores with which the reader should be familiar. For one thing, it is necessary to bear in mind that the true mental age, as we have used it, refers to mental age on a particular intelligence test. A subject has, strictly speaking, a number of mental ages; we are here concerned only with that which depends upon the abilities tested by the new Stanford-Binet scales.

Another characteristic of the mental-age unit is that we do not need to assume for it uniformity of magnitude from year to year. Indeed, the unit appears definitely to decrease with age. The difference between one-year and two-year intelligence, *e.g.*, is so great that anyone can sense it, while even a psychologist might have difficulty in discriminating between the mental levels of twelve years and thirteen years on the basis of ordinary observation. Certainly the magnitude of the mental-age unit shrinks rapidly as mental maturity is approached, just as annual increments in height decrease as the child approaches physical maturity.

Finally, the reader should understand that mental ages at the upper end of the Stanford-Binet scales are not true "mental ages," but instead are more or less arbitrary scores designed to permit the computation of I.Q.'s of superior adult subjects. The magnitude of these units in score points has been adjusted in such a way as to give approximately the same distribution of I.Q.'s for adult subjects as is found for children.

The index of brightness used in the revision to express a subject's brightness or dullness in comparison with others of his age is the intelligence quotient, or I.Q. The retention of this index in the present revision has been prompted largely by practical considerations: in the past 20 years, teachers, school administrators, social workers, physicians, and others who utilize mental-test results have accumulated considerable information in regard to the behavioral correlates of various grades of I.Q. To such persons, the I.Q. has some very definite meaning, whereas a more statistical term would be just so much Greek. Hence the simpler, more widely understood index has been retained.

The advantages of other indexes of brightness, particularly of the standard score, have not, however, been overlooked. The standard score, which is commonly preferred by research workers, gives a subject's rating in terms of his deviation from the mean of the group with which he is compared. For example, if 1,000 unselected ten-year-old children have a mean raw score of 120 points on a given test, and the standard deviation of the raw-score distribution for the group is 20, a subject's raw score of 140 becomes a standard score of +1; a raw score of 160 becomes standard score +2, etc. The merit of standard scores lies in the fact that a deviation of 2 standard scores is presumably twice as great as a deviation of 1 standard score.

For the convenience of research workers, we have provided a conversion table from which it is possible to read off the standard scores corresponding to any particular I.Q., so that those who wish to use standard scores exclusively may do so. As it has turned out, however, the I.Q.'s yielded by the new Stanford-Binet scales are themselves standard scores within a reasonably small margin of error. This comes from the fact that the S.D.'s of the I.Q. distributions of the different age groups show a marked tendency to cluster in the neighborhood of 16 I.Q. points, from which it follows that an I.Q. of 116 corresponds fairly closely to a standard score of +1; an I.Q. of 132 to a standard score of +2, etc. One can therefore say that, so far as practical uses of the scales are concerned, the

I.Q.'s which they yield are about as free from objectionable features as true standard scores.

The correct placement of adult mental age raises certain problems. The placement must take account of the age at which unselected subjects cease to improve in mean score. The precise determination of this age, however, is complicated by the fact that it is extremely difficult to secure truly unselected test populations above the age of fourteen or fifteen. In the present investigation, no effort was spared to secure as representative populations as possible to the age of eighteen.

From our data the yearly gain begins to decrease after the age of thirteen, and by the age of sixteen it has become approximately zero. Chronological age beyond sixteen has therefore been entirely disregarded in computing the I.Q. In view of the fact that age improvement ceases gradually rather than abruptly, we begin at thirteen years to disregard increasing fractions of successive chronological-age increments. From thirteen to sixteen we cumulatively drop one out of every three additional months of chronological age and all of it after sixteen. It was found empirically by the use of the trial-and-error method that this adjustment, in conjunction with the credit allowances finally adopted for tests passed in the three superior adult levels, makes the distributions of I.Q.'s of the older subjects resemble closely those of the younger.

In this connection it should be noted that mental ages above thirteen years cease to have the same significance as at lower levels, since they are no longer equivalent to the median performances of unselected populations of the corresponding chronological ages. A mental age of fifteen years represents the norm for all subjects who are sixteen years of age or older. Beyond fifteen the mental ages are entirely artificial and are to be thought of as simply numerical scores.

Statistical Analysis of Scores

Accuracy of Standardization.—The primary criterion to be satisfied in the standardization of an intelligence scale of the Binet type is that the mean mental-age score for unselected subjects of any chronological age shall agree closely with the mean chronological age. Stated in other terms, this means that unselected subjects of any age shall earn a mean I.Q. of approximately 100. In the accomplishment of this result two main problems are encountered: (*a*) the selection of representative populations at each age, and (*b*) the proper allocation of tests at the various age levels. The methods employed in meeting these problems have been discussed previously.

The accuracy with which the standardization fits the selection of subjects on which it has been based is indicated by the I.Q. means in Table 1. The num-

TABLE 1.—COMPOSITE *L-M* I.Q. MEANS ADJUSTED FOR 1930 CENSUS FREQUENCIES OF OCCUPATIONAL GROUPINGS (SMOOTHED I.Q.'S ONLY)

Age	*N*	I.Q.
2	76	
2½	74	103.3
3	81	104.1
3½	77	102.2
4	83	101.6
4½	79	100.8
5	90	100.4
5½	110	100.0
6	203	99.8
7	202	100.8
8	203	102.0
9	204	102.7
10	201	103.0
11	204	102.2
12	202	101.6
13	204	101.0
14	202	101.3
15	107	101.3
16	102	103.3
17	109	103.8
18	101	

From *Measuring Intelligence*, p. 36.

ber of subjects from one and one-half to eighteen years of age for whom results are included in this table is 3,003.* I.Q.'s there given represent composite mean I.Q.'s based upon both *L* and *M*, in smoothed form. A further adjustment has been made in this table to allow for the overweighting of the standardization group with subjects from the higher socioeconomic levels. The I.Q.'s therefore represent the age means for the composite scores of the *L* and *M* scales adjusted to show the values that would have been obtained for a representative sampling of the native-born white population as classified by parental occupation in the 1930 census.

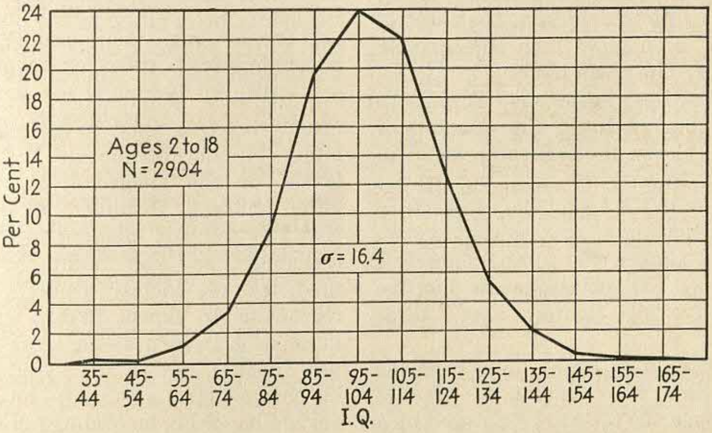

FIG. 1.—Distribution of composite *L–M* I.Q.'s of standardization group. (*From Terman and Merrill, Measuring intelligence, Houghton,* 1937.)

Figure 1 gives the distribution of the composite of the adjusted *L–M* I.Q.'s for the standardization group in terms of the per cent of cases at each of the 10-point I.Q. intervals. In view of the effort made to secure a representative standardization group, and in view of the accuracy with which the scales have been adjusted for difficulty throughout the age range, the curve shown in Fig. 1 probably gives the clearest picture available of the intellectual differences which obtain among American-born white children of the ages in question.

I.Q. Variability in Relation to Age.—The use of I.Q. scores rests on the assumption that variability in terms of I.Q. remains approximately constant from age to age, or, in other words, that variability in terms of mental age is directly proportional to chronological age. Only to the extent that this assumption is true does the I.Q. have constant meaning, as otherwise a given I.Q. at one age might be equivalent to a much higher or lower I.Q. at another age. If, for example, the mean I.Q. at six years were 100, and the standard deviation of the I.Q. 16, then an I.Q. of 116 would fall plus one sigma from the mean for that age. If the mean I.Q. at seven years were also 100, but the standard deviation of the I.Q. 24, then an I.Q. of 124 would fall plus one sigma from the mean for that age. In terms of distance from the mean, therefore, an I.Q. of 116 at age six would be equivalent to an I.Q. of 124 at age seven—a situation which would render impossible any direct comparison of I.Q.'s between subjects of different ages.

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* It was found necessary to omit 181 subjects from the original standardization group of 3,184 because of evidence indicating that they represented a too favorable selection from the general population.

Numerous investigations have shown that scales of the Binet type when carefully standardized do show a marked tendency to yield constant I.Q. variability, at least from fairly early childhood to the adolescent period.

Practice Effects.—Inasmuch as both scales were administered to all the subjects with an interval of from one to a few days between testings, it has been possible to determine the effect of practice upon score with considerable accuracy. The mean increase in I.Q. on the second test is the same from *L* to *M* as from *M* to *L*. The amount of increase shows no noticeable trend in relation to size of I.Q. but varies according to the age of the subjects. In the intermediate age range between five and sixteen the mean increase is about two I.Q. points, below age five and above age eighteen about three points.

One cannot, of course, infer from the above data the amount of practice effect when the tests are separated by a longer time interval. Extensive data from retests with the old Stanford-Binet indicate that when the same scale is repeated a small effect may persist for several months and that, in the case of subjects who have been given the test several times, the practice effect may become a more or less serious matter. If the two scales now available are used alternately, a subject may be retested at relatively brief intervals without risking any appreciable vitiation of the results by reason of practice effects.

Reliability of the Scales.—The reader should not lose sight of the fact that a test with even a high reliability yields scores which have an appreciable probable error. The probable error in terms of months of mental age is of course larger with older than with young children because of the increased spread of mental-age scores as we go from younger to older groups. For this reason it has been customary to express the P.E. of a Binet score in terms of I.Q., since the spread of Binet I.Q.'s is fairly constant from age to age. However, when our correlation arrays were plotted for the separate age groups they were all discovered to be distinctly fan-shaped.

From our analysis it becomes clear that the probable error of an I.Q. score is not a constant amount, but a variable which increases as I.Q. increases. It has frequently been noted in the literature that gifted subjects show greater I.Q. fluctuation than do clinical cases with low I.Q.'s—a phenomenon which has usually been ascribed to scale defects, faulty standardization at the upper levels, or the alleged instability of gifted children. However, we now see that this trend is inherent in the I.Q. technique itself and might have been predicted on logical grounds. It is reasonable to expect that a subject's fluctuation in mental-age score will be proportional, not to the variability of his chronological-age group, but to the variability of his mental-age group.

It follows that the P.E. of the I.Q. must be expressed as a function of the I.Q. It follows equally that the reliability coefficient is inadequate for I.Q. data unless reliabilities are derived

TABLE 2.—ERRORS OF MEASUREMENT AND DERIVED RELIABILITIES FOR VARIOUS I.Q. LEVELS

I.Q. level	$\sigma_{I.Q.}$	P.E.$_{I.Q.}$	Equivalent to reliability of
	(derived from average difference between *L* and *M* I.Q.'s)		
130 and over..	5.24	3.54	.898
110–129......	4.87	3.29	.912
90–109.......	4.51	3.04	.924
70–89........	3.85	2.60	.945
Below 70.....	2.21	1.49	.982

From *Measuring Intelligence*, p. 46.

separately for various I.Q. levels. From the average differences between *L* and *M* I.Q.'s, we may derive the standard error of a test score for the corresponding I.Q. levels, and from these values we may deduce the appropriate reliability. Results of this analysis are presented in Table 2.

It will be seen from this table that in general the probable error of the I.Q. is approximately .03 times the I.Q. The chances are even that a score which falls in the I.Q. range 90 to 109 does not differ from the true score on such a scale by more than 3 points, and the chances are five to one that it does not differ from the true score by more than 6 points, or twenty-two to one that it is not in error by more than 9 points. The probable error of a score above 130 I.Q. is approximately 3.5 points, and for a score below 70 I.Q. it is only about 1.5 points. The chances are twenty-two to one that a score below 70 on one of these scales is not in error by more than 4.5 points. The extreme accuracy of the scales at the lower I.Q. levels will be gratifying to those who make frequent use of the test for clinical purposes and who are rightly concerned with the dependability of their findings.

The last column of Table 2 gives the reliabilities which correspond to the average differences between *L* and *M* I.Q.'s. It will be seen that these reliability values range from .98 for subjects below 70 I.Q. to approximately .90 for subjects above 130 I.Q. For subjects near 100 I.Q. the reliability is .925.

Use of the Scale

The administering and scoring of a standardized intelligence scale does not differ essentially from the procedure of any psychological experiment. The test situation is in fact an experimental situation, one from which generalizations can be made only if the procedures followed in a given instance duplicate precisely those followed with the original standardization group. Administration of an intelligence test involves careful observation of the behavior of one subject, who has been given a precisely defined task to do under rigidly controlled experimental conditions. Any departure from the standard procedures may alter the results in a direction and to an extent not determinable without further extensive research.

In order to secure a valid result in the use of the Stanford-Binet scales, three requirements must be satisfied: (*a*) the standard procedures must be followed; (*b*) the child's best efforts must be enlisted by the establishment and maintenance of adequate rapport; and (*c*) the responses must be correctly scored. It can hardly be said that any one of the three is more important than the others, for all are absolutely essential. Unless the tests are given in strict accordance with the procedures by which they were standardized, the examiner can never be sure what his results mean. If he has failed to enlist the subject's best efforts, the only thing certain is that the resulting score will be too low in some unknown degree. Unless he has learned to score the responses according to the rules which have been laid down, his data will not be comparable to the norms.

Administering the Tests.—The procedure for giving these tests has been carefully standardized for each test situation and should be followed without deviation. It cannot be too strongly emphasized that, unless a standard procedure is followed, the tests lose their significance. The chief danger is in unintentionally and unconsciously introducing variations which will affect the subject's reponse. One who has not had thorough training in psychometrics is unable to appreciate how seriously the omission, alteration, or addition of a single phrase may influence the response.

The examination is begun at the point where the child is likely to succeed, but not without some effort. If the starting point is too difficult, the child may become discouraged and refuse to try; if it is much too easy, he is not sufficiently challenged and becomes overconfident. In the case of children who are presumably somewhere near average in ability, the examination is usually begun with the group of tests just below the child's chronological age. However, if the examiner has overestimated the subject's intelligence and there is a failure in the tests of that group, it is necessary to go back and give all the tests of the previous age group, and so on, until a level has been reached where all the tests are passed. This point is the basal age level. In like manner, the examination should be carried up the scale until an age level has been found in which all the tests are failed. Thus, in effect, the subject is given the entire scale, although actually he is given only that portion of the scale which marks off the upper and lower limits of his ability.

The Importance of Rapport.—The examiner's first task is to win the confidence of the child and to overcome any timidity he may feel in the presence of a stranger. Unless rapport has first been established, the results of the first tests are likely to be misleading. The time and effort necessary for accomplishing this are variable factors, depending upon the personality of both the examiner and the subject. The examiner must himself be genuinely interested and friendly or no amount of skilled technique will enable him to establish a sympathetic, understanding relationship with children.

The competent examiner possesses in a high degree judgment, intelligence, sensitivity to the reactions of others, and penetration, as well as knowledge of and regard for scientific methods and experience in the use of psychometric techniques. No degree of mechanical perfection of the tests themselves can ever take the place of good judgment and psychological insight of the examiner.

The Appraisal of Responses.—Detailed instructions for scoring the tests of both Form *L* and Form *M* are given in Part II of Measuring Intelligence. The examiner, of course, acquaints himself thoroughly with the scoring rules there laid down. It is as important to know what constitutes a satisfactory response as it is to use the correct procedure in presenting the problem to the subject.

Although it would be impossible to overemphasize the importance of mastering thoroughly the scoring rules which have been laid down, the fact remains that the scoring of Binet tests can never be made so objective as the stencil scoring of some of the paper-and-pencil tests. Even the veteran examiner now and then encounters a novel type of response which he finds difficult to classify as plus or minus. A good many of the tests occasionally bring a response so near the border line that the most competent examiners would not agree unanimously in scoring it. The task of those who would use the Stanford-Binet scales is to learn to score each test as nearly as possible the way it was scored in the process of standardizing it. Only in the degree to which they accomplish this task will their results be comparable with the established norms.

While one could wish that the Binet scale were entirely free from subjectivity of scoring, this limitation is the price that is paid for its great flexibility and richness as compared with tests which are stencil-scored. The price is not excessive in view of the greater psychological insight that the Binet type of test affords. Improved forms of this test will doubtless continue to appear, but the method itself is not likely to be superseded.

A fuller conception of the way in which the administering of the tests under standard conditions and the appraisal of responses interact in the practical test situation may be gained by the consideration of some hypothetical cases. Take, for example, the test of similarities and differences which occurs at year VIII on Form *L* of the new revision. This test taps the ability to make discriminative reactions in the absence of the actual object by requiring the child to state, for four pairs of nouns, how they are alike and how they are different. Success in this test depends upon a number of factors other than mere ability to make a discriminative reaction, including the degree of familiarity of the words presented for comparison, the ability of the child to keep in mind a directing idea, and comprehension of the words "alike" and "different"—words whose difficulty level is probably far beyond the actual ability to perceive similarities and differences between words.

In introducing this test, the examiner says, "I'm going to name two things and I want you to tell me how they are alike and how they are different. In what way are baseball and orange alike, and how are they different?" Suppose now that the child responds, "Both are round and baseball is a game and orange is a fruit." This clearly constitutes a success, the response is scored correct, and the examiner proceeds. Suppose, however, that the child says, "Baseball is as round as an orange," and stops. In this situation the examiner is expressly permitted by the instructions to ask, "And how are they different?" If then the child responds, "The baseball is made of rubber," again a successful answer has been given, and the examiner proceeds. But suppose that the child says, "The baseball and orange have tough skin and the baseball is different inside and so is the orange." Here we have a clearly inferior response; not only is the similarity doubtful, but no difference has been expressed. Hence the examiner scores the response incorrect.

When the response has been appraised according to the criteria used in the standardization group, the examiner proceeds to the next item in this test: "In what way are airplane and kite alike, and how are they different?" Should the child say, "One's high up and one's down low," and stop, the examiner is permitted to ask, "And how are they alike?" Then if the child continues, " 'Cause they both go," the response is scored correct. If, however, the child says, " 'Cause they can both fly in the air and they're different because they're different colors," then again we have an inferior response, which is scored as a failure.

The examiner then asks, "In what way are ocean and river alike, and how are they different?" Now the child may answer, "They're both water." No longer do the instructions permit a follow-up question in this case, however; if the child does not spontaneously give both a similarity and a difference at this stage, this item is scored a failure. If he continues by saying, " . . . and one's smaller than the other," then he has maintained the directing idea and obtains credit for the item.

Finally, the examiner asks, "In what way are penny and quarter alike, and how are they different?" Here again, if the child responds with only a similarity or only a difference, no follow-up question is permitted. If, however, he answers, "They are money and one is silver-looking and the other looks like brass," then he has given a correct response and obtains credit.

When the four items of the test have been administered and scored, the examiner totals the successes. Three of the four comparisons must be correct to score plus on this test at the eight-year level.

Consider now a somewhat different type of test—the paper-cutting test which occurs at years IX and XIII of Form *L* of the new revision. This is a simplified form of Binet's paper-cutting test, which ranks as one of the best of the nonverbal tests on the scale.

Material for the test consists of two 6-in. squares of paper. The examiner, taking one of the sheets, says, "Watch carefully what I do. See, I fold the paper this way (folding it over once through the middle, making a rectangle). Now I will cut out a piece right here" (indicating). At the center of the creased edge the examiner then cuts an opening about ½ in. square. He leaves the folded paper exposed, but pressed flat against the table, and is careful to keep the fragments cut from the paper out of sight. Indicating a 3- by 3-in. square which is printed in the child's record booklet, he says, "Make a drawing here to show how this paper would look if it were unfolded (opened). Draw lines to show where the paper would be creased and show how and where it would be cut." He then hands the child a pencil and waits until the child signifies that he is through. If either the creases or the cuts have been omitted in the child's drawing, the examiner repeats, "Draw lines to show where the paper would be creased and show how and where it would be cut," emphasizing the pertinent words.

When the first drawing is complete, the examiner takes the second sheet of paper and says, "Now watch what I do. See, I fold the paper this way (folding the sheet over in the middle). Then I fold it this way (folding it again in the middle, but at right angles to the first fold). And now I will cut out a piece right here." The examiner then cuts off the corner formed by the intersection of the folds, the cut being made about ¾ in. from the corner. Then the examiner proceeds, as before, "Make a drawing here to show how this paper would look if it were unfolded (opened). Draw lines to show where the paper would be creased and show how and where it would be cut."

Scoring of the child's drawing is accomplished by the application of certain rules and by referring to illustrations reproduced in the scoring manual. For the first drawing, for example, there must be only one crease and it must be nearer to the center than it is to either edge of the paper. The cut must be longer than it is wide and must be intersected by the crease, but its location on the crease may be off center and it may be incorrectly placed with reference to its lengthwise dimension. For the second drawing, the cut must be in the center of the square and must be approximately diamond-shaped, with each corner located approximately on the crease. Slight inaccuracies resulting from careless execution are disregarded.

The test is scored plus at the nine-year level if one of the two drawings is plus. Both drawings plus are required for credit at the thirteen-year level.

Consider now a test occurring at a higher level—the Proverbs I test at Average Adult in Form *M* of the new revision. This task is a difficult one, even for adults, since a pertinent generalization is required, based on the rather cryptic, homely situations into which the folkways of thinking have become crystallized. Thus the proverb must be analyzed, abstracted, and applied to life situations. Particularized or literal interpretation is not satisfactory. The interpretation of a given proverb in terms of another pertinent proverbial saying is satisfactory because in order to arrive at such a response the subject must not only have generalized from the particular situation presented by the given proverb but have gone a step farther and reapplied the generalization.

In administering the test, the examiner says, "Here is a proverb, and you are supposed to tell what it means. For example, this proverb, 'Large oaks from little acorns grow,' means that great things may have small beginnings. What does this one mean? 'We only know the worth of water when the well is dry.'" If the subject responds, "We don't know when we're well off until we're poor," the response is scored correct, since the subject has grasped the meaning of the statement and generalized from it. If, however, he says, "You don't know what it means to do without water or anything till your well goes dry and you don't have it," then the response is minus, for the subject has not gone beyond the concrete situation presented in the item to make a generalization.

When the first response has been evaluated, the examiner goes on: "No wind can do him good who steers for no port," and "Don't judge a book by its cover." Similar criteria for scoring obtain here, with credit given only for evidence that the subject is able to transcend the concrete statement in favor of a more generalized interpretation. Two of the three proverbs must be correctly explained to pass the test.

When the testing has been carried out in this way, down to the level at which the subject passes all the tests, and up through the level in which he fails all the tests, the next step is the computation of mental age. The tests at each level cover the preceding period of mental development. For example, if a child is to be credited with a basal mental age of three years he must score plus on all six of the tests listed under the heading year III. Thus, the tests listed under each age heading relate to the age period immediately preceding the heading in question. The six tests under the heading year V cover the period from IV-6 to V; the six tests under the heading year VI cover the period from year V to year VI. Since the age periods are divided into 6-month intervals from years two to five, we count 1 month toward mental age for each of the six tests at a given level in this part of the scale. From year six to fourteen each year group represents an interval of 12 months, and we therefore count 2 months toward mental age for each of the six tests at these levels. Above year XIV, in order to make I.Q.'s for these upper age levels comparable with I.Q.'s at the lower levels, the number of age levels has been increased and the tests at these levels have been given heavier weighting. Accordingly, the number of tests at the Average Adult level is eight, and each test is given 2 months' credit, making a total of 16 months' credit for this level. At Superior Adult level I, each of the six tests receives 4 months' credit, Superior Adult level II has six tests at 5 months each, and Superior Adult level III six tests at 6 months each. It is possible for an adult to earn an I.Q. of 152 on this scale.

To find the mental age, the subject is first credited with all the tests (and the corresponding years and months) below the point where the examination begins, which, of course, is at a year group in which all the tests are passed. To this assumed credit is added 1 month for each test passed up to and including year V, 2 months, for each passed in years VI to Average Adult inclusive, 4 months for each success in Superior Adult I, 5 months for each success in Superior Adult II, and 6 months for each success in Superior Adult III.

The following illustrations of mental-age compution will make the process clear:

Suppose a child, aged four years and two months (written 4-2), passes all the

	Years	Months
Year III, all plus. Basal year level	3	..
Year III-6, 5 tests passed, credit 1 month each	..	5
Year IV, 3 tests passed, credit 1 month each	..	3
Year IV-6, 2 tests passed, credit 1 month each	..	2
Year V, 2 tests passed, credit 1 month each	..	2
Year VI, 1 test passed, credit 2 months each	..	2
	3	14, or

Mental-age score, 4-2

tests at year III, five at year III-6, three at year IV, two at year IV-6, two at year V, and one at year VI. The total credit earned is as shown on page 175.

An adult subject who has passed all the tests at the A.A. level, five at S.A. I, all at S.A. II, and three at S.A. III is scored as follows:

	Years	Months
Credit presupposed, years II–XIV	14	..
Year A.A., 8 tests passed, credit 2 months each	..	16
Year S.A. I, 5 tests passed, credit 4 months each	..	20
Year S.A. II, 6 tests passed, credit 5 months each	..	30
Year S.A. III, 3 tests passed, credit 6 months each	..	18
	14	84, or

Mental-age score, 21-0

The I.Q. is the quotient of mental age (M.A.) divided by chronological age (C.A.). Although the computation is a very simple process, it is found in practice to give rise to many errors. These occur both in converting years and months into months and in the division which follows such conversion. In order to reduce the number of errors from this source, and also to save the examiner's time, we have provided I.Q. tables which appear in the manual for the 1937 revision. From these tables, M.A. and C.A. being given, it is possible to read off the I.Q. directly without any further computation.

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CHAPTER XI

INTELLECTUAL DEVELOPMENT AND RIGIDITY*

JACOB S. KOUNIN

Introduction

The following research is concerned with the problem of the psychological correlates of chronological age. Does chronological age, a measure of the physical age of an organism, have psychological significance? When diagnosing the behavior of an individual is it necessary to consider his chronological age as a distinct variable? If so, is it possible to specify what psychological properties of a human being are related to age as such? It should be noted here that a definite answer to the above questions pertains not only to normal developmental changes and individual differences but also has relevance for a theory of feeble-mindedness.

A scientific solution to a problem is arrived at gradually. At first, the definition of the problem and its answer are vague and approximate. As observations, experiments, and theories progress, the analysis becomes more definite and exact, the last and "best" solution being partly dependent upon previous efforts and inquiries. Accordingly, this chapter is organized as follows: (*a*) As a first approximation, a background of ordinary observational data will be presented. Since the problem is that of ascertaining the psychological correlates of chronological age, one way of starting is by comparing normal adults with normal children. This may provide an investigator with a "hunch." (*b*) As a second approximation, a general theory intended to simplify and organize the types of observational data noted will be stated. (*c*) As a third approximation, a more specific theory in terms of well-defined concepts will be postulated. A useful theory should enable one to deduce logically certain propositions which are capable of being tested by experimentation. (*d*) As a last step, the experiments designed to test the theory will be described and the results summarized in order to see whether the predictions (propositions) arrived at hold.

Background Observations

Age Differences in Behavior Repertory.—A normal adult engages in a greater number and more varied types of activities than a normal child. This may be accepted as a factual statement subject to validation by simple and direct observation. Compared to a child, an adult is able to provide a questioner with more information, supply more details about most life situations, define more words, recognize more people. He is able to do more things and to perform certain functions more efficiently than a child. An adult expresses a greater variety of feelings and emotions, and he shows signs of being interested in a greater variety of phenomena in his physical and social environment. We conclude on the basis of such observations that the adult has more knowledge, abilities, skills, emotions, and needs.

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* More detailed accounts are presented in 11, 12, 13. Adapted with the permission of the Duke University Press.

Age Differences in Simple Unity.—The application of an observational procedure provides information about another type of developmental change: a child seems to behave more as-a-whole than does an adult. The movements of infants are characterized by more mass action. It appears that the older the person, the more independently various parts of the bodily mechanism function. For example, an adult can move a single finger without moving others whereas an infant cannot. There are behavioral indications of increasing functional segregation of other systems as age increases: the connection between inner needs and motor expression appears to be very direct in children. An adult, for example, may be hungry and hardly express it in overt activity, but one can detect quite exactly the degree of hunger of an infant from records of bodily movements. Proceeding to less directly observable phenomena, there seems to be increasing functional independence of central parts of the personality with increasing age. A frustrated need affects almost all of a young child's inner state. If a young child is even mildly thirsty, his whole mood and outlook on life seems to be affected and he will be cranky and ill-tempered "all over," while an adult may be pleasant and retain his normal perspective even though he is thirsty.

The Need for a Theory of Age Differences.—By continuing to observe the behaviors of children and adults, it would be a simple matter to accumulate an endless number of facts. Such a procedure could engage the efforts of countless individuals for an indefinite period of time. How can the human mind learn, retain, and comprehend such an enormous array of facts? If merely for the purpose of "thought economy," of being able to include many facts in one "mental category," it is essential to invent some concepts to make possible the classification of the existing knowledge. Suppose the facts are classified. What do they mean? How are they to be explained? For the purpose of explaining and giving meaning to the facts, it is necessary to develop theories. Facts without theories have no meaning, just as the observation that apples fall has no scientific meaning without the theory of gravitational forces.

General Setting for a Theory of Development

Psychological Structure.—Why do normal adults exhibit a wider range of behaviors than normal children? Behavior differences may be partly due to the nature of the situation (*e.g.*, secure-insecure) or to the condition of the person (*e.g.*, high tension—low tension) or to the psychological make-up of the persons being compared. Only when situations and conditions are equivalent is it permitted to attribute behavioral variations to the persons, to localize the differences "in" the individuals. This assumes individual differences in what may be called the psychological make-up of people. In order, then, to account for some of the differences in the behaviors of normal adults and children it is necessary to develop a theory of psychological structure and to postulate developmental changes in this hypothetical structure.

Degree of Differentiation.—The theory has to do with the structural characteristics of the psychological person. It will be stated in terms of the concepts and language of topological and vector psychology (14, 15, 16). This system postulates that the person is structured into parts called "regions." Unfortunately, psychological structure cannot be determined by direct observation as one would count the number of cells in the body tissue. It can be ascertained only indirectly; it is inferred from behavior.

The *degree of differentiation* of the person refers to the number of part regions. The theory maintains that, normally, the degree of differentiation of the person increases with age. This theory would partly account for the rough observation that the normal adult has a larger and more varied repertory of behavior than the normal child.

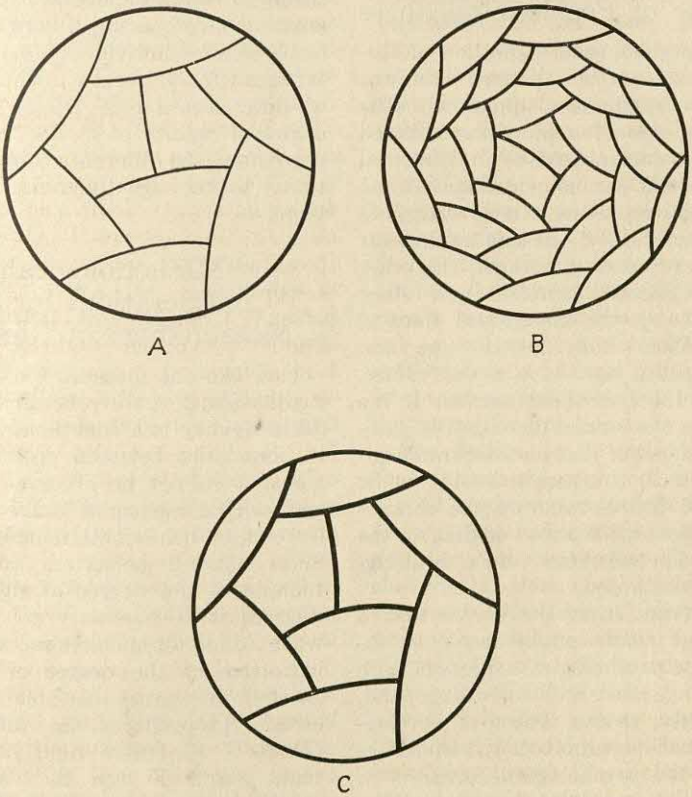

FIG. 1.—Representation of a theory of development. *A*, normal child. *B*, normal adult. *C*, feeble-minded person of mental-age *X*.

Degree of Rigidity.—It was noted, however, that an adult not only has more "parts" than does a child, but these parts seem to function more independently of one another. What kind of a theory would explain this relationship? If we assume separate regions making up the whole person, we also have to postulate some sort of a boundary between these regions. An important property of this boundary is its *degree of rigidity*.

The degree of rigidity refers to the degree of the functional relationship between neighboring regions of the person's structure. The more rigid the boundary, the less one region affects neighboring regions. The theory assumes that the degree of rigidity of the person increases with chronological age. Thus, for example, a child may be frustrated with reference to his need for attention, and the effect of this will spread to affect the condition of his need to read a book (*i.e.*, eliminate the desire), but the adult's interest in a book will be little affected by the frustration of his need for attention.

The two aspects of this proposed theory of development are represented diagrammatically in Fig. 1 (comparison of *A* and *B*). This shows that the adult has more regions and that the boundaries between the regions are more rigid (as represented by the thickness of the lines).

General Setting for a Theory of Feeble-mindedness

The psychological definition of feeble-mindedness is expressed in terms of the intelligence quotient. This criterion of feeble-mindedness is based upon two general variables: (*a*) mental age, and (*b*) chronological age. If one were to represent these variables diagrammatically, one axis would refer to time (chronological age), the other to the general developmental stage attained by the individual (mental age). When both mental age and chronological age have equal values, we call the individual normal. If the value on the mental-age axis is significantly ahead of that on the chronological-age axis, the person is said to be superior. If the value on the chronological-age axis is ahead of that on the mental-age axis, the person is designated as retarded.

It follows from the above that a theory of feeble-mindedness must involve the psychological aspects of both mental age and chronological age; and, conversely, that a theory of development which pertains to both mental age and to the psychological correlates of chronological age has relevance for a theory of feeble-mindedness. When one compares the performances of a normal individual with those of a feeble-minded individual of an equal mental age in any equivalent situation, one is actually comparing individuals who do not differ in mental age but who do differ in chronological age; for example, one is comparing a six-year-old person who has been assigned a mental age of six with a twelve-year-old person who has a mental age of six. They do not differ in mental age, but they do differ in chronological age, and the explanations of any difference obtained would have to be derived from the component of a theory of development that deals with the psychological correlate of chronological age.

In terms of the two aspects of our theory of development, we can state a theory of feeble-mindedness and represent it by comparing a normal and a feeble-minded individual of equal mental ages (Fig. 1*A* and *C*). Their degree of differentiation is equal, but the degree of rigidity of the feeble-minded is greater—the difference being proportional to the age difference between them.

Methodological Considerations for the Measurement of Rigidity

How can one measure the degree of rigidity and test the preceding theory? Since rigidity is a functional property of boundaries between postulated regions, it cannot be observed directly and can be measured indirectly only by certain behavioral manifestations. Since not all behaviors are symptomatic of the degree of rigidity, as defined, it is necessary to ascertain what kinds of behaviors would be indicative of the degree of rigidity. Briefly, one must be able to state certain propositions, as follows: *If* person *X* has more rigid boundaries than person *Y then* such and such should happen when their behaviors are compared under such and such conditions.

In addition to prescribing definite conditions and actions as symptoms and measures of rigidity, it is necessary to control other variables that might affect the behaviors studied. Specific behaviors may be shown to be affected by the degree of rigidity of a person, but at the same time factors other than rigidity could have an influence upon the same behaviors. A person may behave "rigidly": in an "either-or," fixated, pedantic, stubborn, or typed manner. But are these overt behaviors symptoms of inner rigidity? Or, might "behavioral rigidity" be a resultant of other properties of the person or of the situation?

Some factors other than inner rigidity which might produce "behavior rigidity" are: (*a*) *The general degree of differentiation* of the person. The person who has a small behavior repertory will behave in a stereotyped manner because he has relatively few possibilities of action. (*b*) *The degree of differentiation of relevant areas.* One can speak of the degree of differentiation of a person as a whole (*i.e.*, total knowledge, skills, interests, etc.), and the person's degree of differentiation in particular areas (*i.e.*, knowledge of mathematics, history, etc.). A person with a high total degree of differentiation may behave very rigidly, in a pedantic either-or fashion, in a particular situation because his knowledges and interests may not pertain to that specific situation. (*c*) *Security of a person in a particular situation.* Fear of failure, uncertainty as to consequences, hesitancy to enter unfamiliar situations, are psychological factors which tend to result in a person's remaining fixated in relatively few regions of activity.

In order, then, to secure behavioral measures of inner rigidity, it is essential to reduce the influence of other pertinent variables to a minimum. In the following research two major methodological problems pertaining to a test of the theory are of especial significance: (*a*) the use of a strict logical procedure to deduce what specific kinds of behaviors are symptomatic of the degree of rigidity, as defined; (*b*) the control of pertinent variables. The "total degree of differentiation" of all subjects was controlled by equating them on the basis of Binet mental ages. The differentiation of particular areas and the security in those areas were controlled experimentally.

Experiments in the Measurement of Rigidity

This section will present four of the experiments which have been conducted to test the theory of rigidity that has been sketched in the preceding section. Each of the experiments was performed with a definite purpose and was set up to test a particular theorem. Since the conceptualization and rationale of an experiment is a pertinent part of the methodology, in fact precedes the design of an experiment, the following outline of presentation will be used: (*a*) the theory behind each experiment will be indicated; (*b*) the experimental method designed to test the theory will be described; and (*c*) a summary of the results will be presented.

The Subjects.—It has been shown that the general degree of differentiation of a person could affect behaviors which might be regarded as criteria of rigidity. For this reason, all subjects studied in these experiments were equated on the basis of Binet mental ages. All subjects, then, had equal mental ages but varied in respect of chronological age; this means, of course, that they differed also in I.Q. Since physiological and structural defects of a person may interfere with normal developmental changes correlated with chronological age, only subjects of normal physiological-anatomical condition were used. All the feeble-minded subjects were diagnosed by physicians as physically normal persons, free from any detectable physiological disturbance or anatomical defects.

The following tabulation presents a summarized description of the subjects.*

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* For those subjects whose chronological ages were above sixteen years, a chronological age of sixteen years was used in computing I.Q.'s.

Subjects	Old feeble-minded	Young feeble-minded	Normal
Number	21	21	21
Mean mental age	80 months	82 months	82 months
Range	69 to 94	72 to 96	72 to 92
Mean chronological age	41.7 years	14.5 years	6.8 years
Range	29 years, 3 months to 53 years, 9 months	10 years, 10 months to 17 years	6 years, 0 months to 7 years, 9 months
Mean I.Q.	42	48	99.76
Range	38 to 52	38 to 63	88 to 109

Experiment I. Satiation and Cosatiation.—John secures an ice-cream cone and eats it. His liking for ice cream is slightly lessened. As he consumes more ice cream, his liking for it gradually is reduced. Finally, he has about all he wants. If he eats more, he eventually will arrive at a state of actually disliking it. This process of changing the attractiveness of an activity and state of a need by repetition is called "satiation." The process whereby the satiation of one need (*e.g.*, need for ice cream) satiates another need (*e.g.*, need for cake), is called "cosatiation."

The Theorem.—The theorem states: "For a given mental age, the older an individual, the less will the satiation of one need cosatiate neighboring needs." How was this theorem derived?

The general theory proposed in these studies is that rigidity is proportional to chronological age. Since of two individuals, one normal and one feeble-minded, both with the same mental age, the latter is older, it follows that, for a given mental age, rigidity is proportional to the degree of feeble-mindedness. Rigidity is defined as the independence of neighboring regions. "Independence" of regions (functional segregation) means that a change of one region has little effect upon the condition of the other. Satiation is one kind of a change in the condition of a need region and cosatiation is the effect of this change upon a neighboring need region.

Experiment I was designed to create a situation of equal differentiation and security for all subjects, to create equivalent needs in all subjects, to satiate one of these needs, and then to measure the degree to which the other needs were cosatiated. According to the theorem, the normal subjects should be cosatiated most, the old feeble-minded subjects should evidence the least amount of cosatiation, and the young feeble-minded subjects should fall between the other two groups of subjects in respect to the degree of cosatiation.

Method.—Each subject was presented with four drawing activities, placed on separate tables in a room. These drawing activities are illustrated in Fig. 2. The subject was shown how to draw cats, bugs, turtles, and rabbits until he felt confident and secure in these activities. He was then allowed to draw cats until he became satiated and wanted to draw no more. After having become satiated with the drawing of cats, he was asked if he wanted to draw bugs. After having become satiated with drawing bugs, he was asked if he desired to draw turtles. Finally, after having become satiated with drawing turtles, he was asked whether or not he felt like drawing rabbits.

The situation was made as free as possible and a minimum of pressure to continue drawing was placed upon the subject. (The degree of freedom actually created in the situations was indicated partly by the spontaneity in general behavior and verbal expression and partly by the fact that over 50 per cent of the subjects with whom the experiment was started felt sufficiently free to refuse to draw or drew objects entirely unrelated to the experimental situation.)

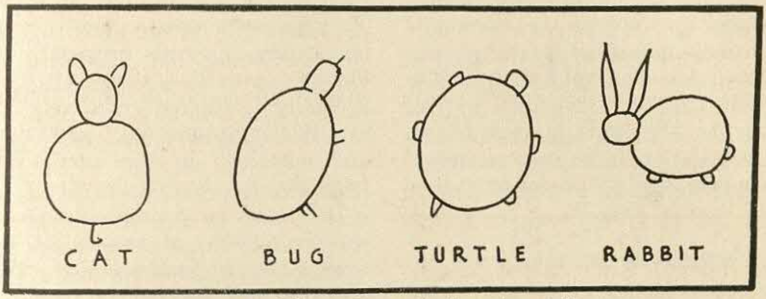

FIG. 2.—Objects drawn in Experiment I.

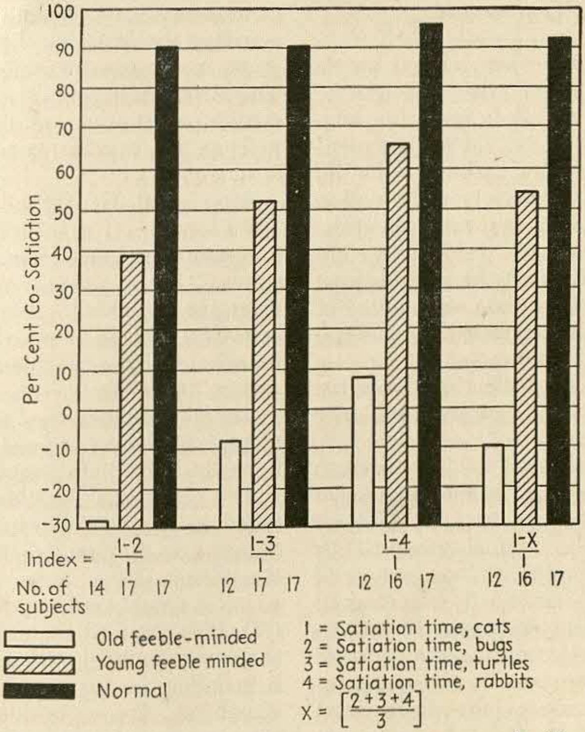

FIG. 3.—Mean cosatiation indexes of the three groups of subjects.

Results.—The theorem makes no statement about satiation time as such (the amount of time a person spends drawing until he voluntarily stops); it refers only to the extent to which satiation tension spreads from one region to another. It is reasonable to assume that the subject would have spent approximately the same amount of time at the second drawing activity as he did at the first drawing activity had the second activity been given first; *i.e.*, for any one subject, those factors determining absolute satiation time for drawing cats are the same as those determining satiation time for drawing bugs (or rabbits, or turtles).

In order to measure the amount of cosatiation, an index of cosatiation was computed for each subject, using his satiation time on the first drawing activity as the basis of comparison. This cosatiation index was expressed by a percentage. The formula used was:

$$\frac{\text{Satiation time on cats minus satiation time on bugs (or turtles, rabbits)}}{\text{Satiation time on cats}} \times 100$$

An index of 0 per cent or less means that satiation of the cat-drawing activity had no effect upon the bug-drawing activity; *i.e.*, the subject spent as much time drawing bugs as he did drawing cats. Conversely, a cosatiation index of 100 means that satiation of the cat-drawing activity resulted in complete cosatiation of the bug-drawing activity. Intermediate amounts of cosatiation are expressed by indexes between 0 and 100.

The mean cosatiation indexes of the three groups of subjects are graphically represented in Fig. 3.*

It can be seen that the least amount of cosatiation was found in the old feeble-minded group and the greatest amount in the normal group. (The difference between any two groups of subjects was statistically significant.) The differences between the three groups of subjects in the degree of cosatiation were revealed by quantitative time measures, by their overt behavior, and by the nature of their drawings. The behavior of the old feeble-minded subjects while drawing bugs, turtles, and rabbits was no different from their behavior while drawing cats. In contrast, other marked cosatiation effects in addition to the quantitative time measures were revealed in the case of the young normal subjects. They paused more frequently and for longer time intervals, engaged in non-drawing activities more often, and generally exhibited relatively more satiation symptoms (such as variations and mistakes) in the later drawing tasks than in the first drawing task.

It should be pointed out that the smaller amount of cosatiation found among the old feeble-minded subjects was obtained *in spite of* their longer absolute satiation times. Actually, the more time an individual spends in one activity, the less time he is likely to spend in subsequent related activities. The latter statement is supported by studies on satiation and cosatiation as well as by studies concerned with fatigue (4, 10).

Experiment II. Transfer of Habit. *The Theorem.*—The theorem which the following experiment is designed to test states: "For a given mental age, the older the individual, the less will his behavior, while in an activity region A, be affected by a neighboring activity region." Conversely, the older and/or more feeble-minded the individual, the more is his behavior solely dependent upon the immediate situation.

The derivation for this theorem is based upon the following reasoning: Suppose, as represented in Fig. 4, that the person (P) is in one region (A), which is neighbored by another region (N). It is assumed that the rigidity of the person parallels the rigidity of the boundaries in his psychological environment. By definition, the more rigid the boundary between A and N, the more independent is A from N and the less is A affected by N. Since the person is in A, the less is his behavior influenced by *N*. Therefore, since rigidity is a function of chronological age, then, for a given mental age, the older and/or more feeble-minded a person, the less will his behavior be influenced by a neighboring region (*N*).

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* The number of subjects is not constant for all the cosatiation indexes. This is due to the fact that some subjects spent so much time on the first or first few drawing activities that it became necessary to interrupt the experiment in order that the subject might have his noon or evening meal.

The following experiment was designed to test theorem 2 by having the subject perform an action in a certain manner while in one situation (*N*), to place him in another situation (*A*) involving an action differing from the one used in (*N*), and to measure the extent to which the action of the previous situation influenced his behavior while in the second situation.

Method.—The apparatus used was similar to that designed by Schwarz (21, 22) in his studies on unlearning. This consisted of a box into which marbles were introduced, one at a time. The subject could release the marble by either depressing or raising a lever at the side.

Each subject was given three series of 30 trials in which he released the marbles, one at a time, by depressing the lever. One-third of the marbles was red, one-third was black, and one-third was blue. After each marble was released by the apparatus to fall into a container, it was placed by the subject in a compartment corresponding to the color of the marble. This was done as rapidly as possible. This series of actions constitutes Situation 1.

Part of the situation was then changed by instructing the subject to raise instead of to depress the lever. There were two series (referred to as Situations *D* and *E* in Fig. 5) of 30 trials in which the subject was required to raise the lever. This is Situation 2. The effect of Situation 1 was determined by the number of times the subjects entered (*i.e.*, behaved appropriately to) that situation after having been placed in the second situation. Thus, the more errors made by the subject (depressing the lever) the more he was being influenced by Situation 1 while in Situation 2.

On the basis of the theory, one would predict that the normal subjects would make the most errors—be most likely to be influenced by Situation 1 while in Situation 2—and that the old feeble-minded subjects would make the least number of errors—be most affected by the immediate situation only.

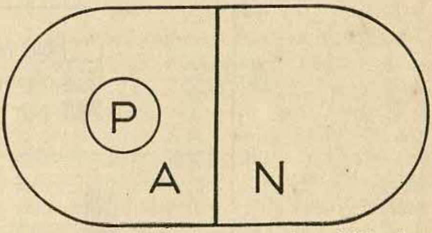

FIG. 4.—Representation of neighboring region.

Results.—A summary of the results is given in Fig. 5. These results support the theory by showing that the normal subjects made the greatest number of errors, and the old feeble-minded subjects made the fewest errors. Thus, the old feeble-minded subject is least likely to be in an overlapping situation. He is either in the one situation "pushing the handle down," or in the other situation, "pulling the handle up," but is rarely influenced by both situations simultaneously.*

Experiment III. Integration by Classification. *The Theorem.*—Theorem 3 states: "For a given mental age, the older the person, the more likely is he to structure a new field which is perceptually ambiguous into a relatively large number of separate independent parts"; *i.e.*, he will organize the situation in a less integrated manner than will a younger person of the same mental age.

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* In connection with the discussion in the section on Methodological considerations (p. 182) of the difference between "behavioral rigidity" and inner-person rigidity, it should be noted here that, in the type of situation described in this experiment, the "behavioral rigidity" of the old feeble-minded person is actually *less* than that of the normal person.

In order to make the reasoning behind this and the following experiment more concrete, the logic of the derivation will be discussed briefly after the method and results are presented.

Method.—The general method employed in this and in the following experiment, Experiment IV, has been used rather widely by other investigators for various problems (2, 7, 23). The procedure is to present to a subject some objects that can be grouped together in various "classes" and to instruct the subject to arrange them in groups or categories. Such a method has been utilized in studies related to the thinking processes of individuals, especially with reference to "concrete" and "abstract-mindedness."

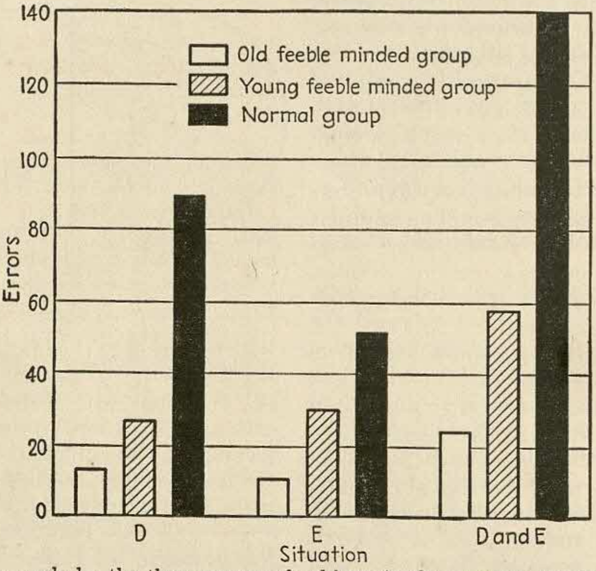

FIG. 5.—Errors made by the three groups of subjects in the transfer-of-habit experiment.

Setup A.—The initial condition specified in Theorem 3 requires that the subjects be equally differentiated in equivalent areas. Setup *A* was performed as a control experiment to make sure that the subjects understood the directions, had a certain experience in common, and possessed the necessary abilities and discriminations to perform the activity.

Twenty-five cards were presented to each subject, who was required to classify them into five groupings. There were five cards of each of the following colors: black, yellow, green, pink, and red. The instructions for this and subsequent classification tests were:

> Here are some things all mixed up. Some of these are the same and belong together. Here are five boxes. Suppose you find some that are the same and belong together and put them in one of the boxes. Then find some others that are the same and put them in another box, then find some others that are the same and put them in another box, and keep on going until you have all those that are the same together.

All subjects classified the cards into five color categories without any apparent difficulty; *i.e.*, they placed all the red cards in one box, all the blue cards in another box, and so on. This indicated that the subjects understood the directions and possessed the necessary color concepts and discriminations.

Setup B.—The purpose of this setup was to test Theorem 3 by comparing the behaviors of the subjects when required to classify a set of perceptually ambiguous cards. Twenty-five cards were used, five each of the following forms: triangles, squares, circles, crosses, and five-pointed stars. There were five cards of each of five shades of blue (painted with water colors). (For example, each triangle was painted in a different shade of blue.) The colors were perceptually of three rather distinct categories: five purplish blue, five navy blue, and 15 light blue. Of the light blue cards there were five of each of three shades, which varied little from one another. The cards can be described as possessing various forms easily discriminated from one another, as having some colors which were readily distinguished from one another, and as having still other colors which could be distinguished one from the other only with considerable difficulty. At times the quality of form seemed to stand out most, at other times the color attracted the observer's attention.

Results.—The behavior of the majority (62 per cent) of the old feeble-minded subjects can be described as follows:

1. The cards were classified in more than five groupings.
2. The groupings were not consistent with one another. Some were made on the basis of form, and others on the basis of color.
3. Minor differences between the cards were not overlooked.
4. The subjects compared but two or three of the cards at a time.
5. The subjects manifested extreme "immediate-mindedness." Their classifications were dependent upon the specific card or pair of cards they happened to be considering. What they did in the "past" or planned to do in the "future" apparently had little or no influence upon their "present" behavior.

These characteristic behaviors of the old feeble-minded subjects are exemplified in the following protocol of a typical subject.

Old Feeble-minded Subject 2: *Chronological Age, Forty-three Years, Nine Months; Mental Age, Seven Years, Two Months; I.Q.* 45.—He put two light squares in box *A* at 20 sec.; and at 40 sec. added another light square. He then put three light circles, one at a time, in box *B*; two dark circles in box *C*; and two dark squares in box *D*. He put one dark triangle in box *E*, and after about 10 sec. hesitation added the other dark triangle. He placed one light triangle in box *E*, hesitated, removed it, put it back, and after about 15 sec. added another light triangle to it. After looking over the cards in a thoughtful manner, he put two dark stars in a separate pile in box *C*; started to add a light star, hesitated, and finally put three light stars, one at a time, into box *D*. He added a light triangle to box *E*, placed three light stars in box *A*, and two dark crosses in box *B* (4 min., 15 sec.). He then sat back, indicating that he had finished.

His arrangement of the cards at this time was as follows:

Box *A*	Box *B*	Box *C*	Box *D*	Box *E*
3 light squares 3 light crosses	3 light circles 2 dark crosses	2 dark circles 2 dark stars	2 dark squares 3 light stars	2 dark triangles 3 light triangles

The experimenter asked, "Are you sure you have only those that are the same together?"

The subject said, while pointing, "These *squares* here, these *crosses* here, these dark squares here, these light circles here . . . "

The experimenter further instructed, "You're supposed to have those that are the same in one box. One box can have only one kind. There are supposed to be five in a box."

The subject removed two dark crosses from box *B*, examined them and put them back; studied the dark circles, then put them back; examined the dark squares, saying, "These two are just alike," and replaced them in box *D*.

The experimenter said, pointing to box *D*, "Are those [two dark squares] the same as those [three light stars]?"

The subject answered, "No. These are blue squares, and those are kind of light stars."

The experimenter then said, "If they're not the same, they shouldn't be in the same box."

The subject then removed the two dark squares from box *D* and placed them in a separate pile in box *E*, removed the dark circles from box *C* and slowly placed them in box *D* (10 min.).

He looked around at the boxes, pointed to the three light crosses in box *A* and said, "These are different colors, these crosses," after which he removed two of the crosses and placed them in box *B*.

Pointing to the two dark triangles in box *E*, he said, "This ain't the same color as this one." He removed them and put them in box *A* (13 min., 45 sec.).

He carefully removed one of the light circles from box *B* and placed it in box *C*; removed the three light squares from box *A*, and placed them, one at a time, in box *B*.

He then matched the three light triangles in box *E* with one another and remarked, "One is a little bigger," and removed it from the rest, placing it in box *C*.

The subject removed the two dark stars from box *C*, carefully matched them, and said, "Just about the same. This one is a little bigger than the other one," and placed them in box *E* (18 min.).

Holding up the two dark circles which were in box *D*, he said, "Just about alike. One's kind of blue and one violet. One's more blue. Different colors in them," and, after manifesting signs of conflict, replaced them in box *D*.

He then removed the two light circles from box *B*, compared them and said, "These are different colors in them," and hesitatingly put them back (20 min., 5 sec.).

The experimenter then stopped the experiment.

His arrangement of the cards at this time was:

Box *A*	Box *B*	Box *C*	Box *D*	Box *E*
1 light cross 1 dark triangle 1 dark triangle	2 light circles 2 dark crosses 3 light squares 2 light squares	1 light circle 1 light triangle	3 light stars 2 dark crosses	2 light triangles 2 dark squares 2 dark stars

The majority (60 per cent) of the young feeble-minded subjects classified the cards into five form categories, without any evidence of confusion or consideration of color.

The behavior of the normal subjects differed from the behavior of both the young feeble-minded and the old feeble-minded subjects. The greatest proportion (44 per cent) of the normal subjects originally classified the objects on the basis of fewer than five color categories: purplish blues (five cards), dark blues (five cards), and light blues (15 cards). After the experimenter corrected them by saying: "There are supposed to be five in a box," the subjects reclassified the cards into five color categories without difficulty.

Another behavior found only among the normal subjects was the spontaneous changing of a classification. Twenty-eight per cent of the normal subjects started to classify the cards on the basis of color, but, before having completed the sorting, spontaneously changed to a form classification. Nine per cent of them started to sort the cards by form but spontaneously changed, before completing the trial, to sort the cards into color categories. In all, 37 per cent of the normal subjects spontaneously changed their method of classifying the cards.

A summary of the results for the three groups of subjects is given in Table 1.

TABLE 1.—BEHAVIOR OF THE THREE GROUPS OF SUBJECTS IN SETUP *B*

Behavior categories	Subjects, per cent		
	Old feeble-minded ($N = 21$)	Young feeble-minded ($N = 20$)	Young normal ($N = 21$)
Classification of objects on the basis of form without verbal or behavioral consideration of color..........	19	60	19
Spontaneous classification on the basis of form, after having started on the basis of color................	0	0	28
Inconsistent classifications (failure) followed by correct classification on the basis of form *after* experimenter's corrections...................................	5	15	0
Classification on the basis of color*..................	5	0	0
Spontaneous classification on the basis of color, after verbal or behavioral consideration of form..........	0	0	9
Classified cards in fewer than five color categories, and changed to five categories after experimenter's correction..	0	0	44
Inconsistent classifications, followed by classification on the basis of color after experimenter's correction.....	9	20	0
Failure to classify the objects consistently on the basis of form or color even after corrections of experimenter...	62	5	0

* A color classification was correct if there were fewer than five errrors, since some of the differences between colors were very difficult to discriminate.

Interpretation.—It has been shown that the concept of rigidity applies to regions in the psychological environment as well as to inner-personal regions. This has bearing upon any problem which involves the degree of functional interdependence of regions, such as: the amount of influence of a background situation upon an immediate region, the extent of overlapping of regions (*cf.* Chap. XXVI), the degree of unity of paths, and the effect of "past" and "future" upon a "present" activity field.

The old feeble-minded subject is to be characterized by the greater degree of rigidity, by postulation. Thus, the older and/or more feeble-minded an individual, the more is any subregion of activity involved in a task (*i.e.*, a particular pair of cards) independent from the other subregions of activity (*i.e.*, the other cards). This prevents the activity as a whole from becoming unified The different units of activity in the older subject's path toward the solution of the task are functionally more segregated, and, as a result, the region in which he happens to be at a particular time dominates his attention. If the form quality of a pair of cards he is considering is perceptually most outstanding he places the cards in a form pile; if the color quality is most dominant in the next pair he places them in a separate color pile; and so he continues to make a considerable number of separate, unrelated classifications. The "immediate-mindedness," the lack of relationship between a "present" classification (*i.e.*, made on the basis of form) and an immediately "past" classification (*i.e.*, made on the basis of color), are derivable from the general statement of the functional separation of one region from the others. The end results of the performance were also predicted in the theorem: the old feeble-minded subject ends with more than five groupings (more independent regions) and with groupings inconsistent with one another (functionally separated).

In the case of the young feeble-minded subject, both the form and color paths are integrated. He takes the path which, as a whole, is more potent. As a rule, form is perceptually more outstanding than color, and he takes the form path of classification. While he is in the region of form, however, the influence of color is negligible. As a result, the young feeble-minded subject neither changes his basis of classification spontaneously, nor does he give any indication of considering color.

The normal subject appears to be more affected by his past action and is in more of an overlapping situation than the feeble-minded subjects (is simultaneously influenced by both form and color). Hence, since he had grouped the cards in Setup *A* on the basis of color, he classifies the cards in Setup *B* on the basis of color, though harder to do than on the basis of form. In addition, there are fewer than five segmented regions in the color path of his initial classification, *i.e.*, he groups the cards in two or three classifications. He easily regroups the cards into five categories after the experimenter's corrections. The fact that the normal subjects are to a greater degree in an overlapping situation and more readily reorganize a field than the feeble-minded subjects (note Theorem 4) is indicated by their spontaneous changing of classifications from color to form, or vice versa.

Experiment IV. Restructuring by Classification. *The Theorem.*—Theorem 4 proposes that: "For a given mental age, the older an individual, the more difficult will it be for him to restructure (reorganize) a given field."

This theorem is one further step from the preceding theorems and involves many of the same logical steps included in them. It presupposes that the person has structured and integrated the component parts of one situation. The person who is to be characterized by a great degree of rigidity (*i.e.*, an old feeble-minded person) is dependent upon that situation and is less influenced by another. In order to reorganize a given situation, it is necessary to be able to change one's existing mode of perceiving and reasoning and at the same time see a different way of integrating the situation. Both of these necessary components of the act of reorganization are hindered by rigidity.

Method.—The subject is given experiences in two procedures of classifying cards: a color grouping (Setup *B*) and a form grouping (Setup *C*). He is then presented with a group of cards which consists of the same forms and colors that he had experienced, in order to see whether he is able to change from one type of classification to the other. A method was designed to measure the degree of difficulty encountered in producing the reorganization, by determining the amount of "pressure" necessary to apply to a subject in order to effect a change in his method of classifying the cards.

Setup C. The 25 cards were made of the same forms utilized in Setup *B* of Experiment IV. All cards were made of yellow cardboard. The procedure was the same employed in the other classification tests. This was used to give all subjects the experience of a form classification, as well as to ensure that all could make the necessary form abstractions and discriminations.

All subjects were able to classify the cards into five forms without any noticeable difficulty.

Setup D. Twenty-five cards were used whose colors were the same as those used in Setup *A* of Experiment IV and whose forms were the same as those used in Setups *B* and *C*. They were presented to the subject as previously (Trial 1). After he had classified the objects correctly, on the basis of either color or form (*all* subjects successfully performed the task by one method or the other), the experimenter reshuffled the cards and returned them to the subject with the instructions to "do them again" (Trial 2). If the subject did not change his method of classifying the cards after the second trial, the cards were reshuffled and he was asked to sort the cards "again" (Trial 3).

Should the subject have continued on the same basis of grouping on Trial 3, the experimenter reshuffled the cards and gave them to the subject with the instructions to "put them together some other way" (Trial 4).

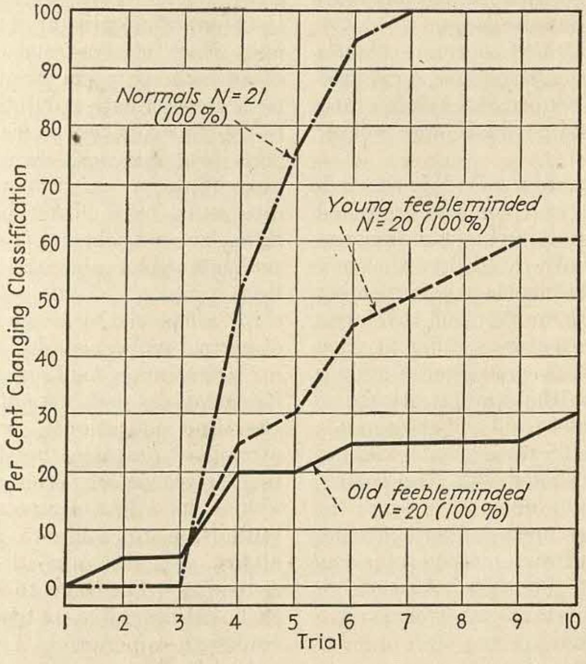

FIG. 6.—Cumulative per cent of subjects changing classification.

If the subject still did not change his method of grouping the cards, the procedure was repeated, with the instructions stated as follows: "No, find some *different* way. See if you can find some *other* way that they belong together" (Trial 6).

This was continued for a maximum of 10 total trials. In case the subject at any time refused to continue, he was urged to continue trying by such comments as: "Sure you can do it. If I thought that you couldn't, I wouldn't have asked you to come up. Go ahead, I know that you can find some other way to do it." Such statements always resulted in inducing a renewed effort from the subject.

Results.—All subjects were able to classify the cards into five groupings either on the basis of five forms or on the basis of five colors. Approximately the same number of subjects chose to classify the cards into color groupings as classified the cards into form groupings.

Figure 6 shows the per cent of subjects in each group that changed their method of classifying the cards (restructured the field), and the trials in which the changes were effected. These results are in line with the prediction made in Theorem 4. The old feeble-minded persons are least able to restructure a given field (30 per cent of them change their classifications), while the normal subjects are best able to do so (100 per cent change classifications). In spite of the fact that the greatest number of normal subjects changed their classifications it required the least force to stimulate their regrouping (fewer trials and weaker requests).

The grouping of the cards in Setup *D* on the basis of color was of equal difficulty as grouping them on the basis of form, as shown by the fact that half of the subjects put the colors together and half of them grouped the forms together. The factor of differentiation of distinct abilities and discriminations cannot explain the findings. As shown in Setups *A* and *C* all the subjects are able to group 25 cards on the basis of either form or color. The rigid person, however, while able to classify the cards one way or the other, becomes fixated in the one method of doing it and, once in that situation, is unable to "see any other way out" spontaneously.

The Concept of Rigidity as Applied to Feeble-mindedness

Differences between Normal and Feeble-minded Person of Equal Mental age.—Ever since psychologists and educators have been aware of the category of feeble-mindedness they have been concerned with the nature of the differences between feeble-minded and normal individuals. Authorities disagree as to whether the differences between feeble-minded and normal individuals are of a "qualitative" or of a "quantitative" nature; whether they are differences of "kind" or "degree" (5, 19). The attempts to compare the nature of feeble-minded and normal individuals might be classified roughly into three types of investigations.

Comparison of the Responses of Normal and Feeble-minded Individuals on Standardized Tests.—Much of the work in this area has been devoted to determining which test items on the Binet and other mental tests are easier or more difficult for feeble-minded persons than for normal persons of equal mental ages. Such studies reveal differences, using as a criterion of difficulty the percentage of each group that passes or fails on specific test items. In general, tests involving considerable experience, memory, and concrete performances are passed by a higher percentage of feeble-minded subjects. Tests placing a premium upon abstractions, adaptations to new situations, seeing relationships, are passed by a higher percentage of normal individuals (1, 8, 17, 24).

Comparison of the Learning Ability of Feeble-minded and Normal Individuals. Practical educational problems and attempts to explain the slower rate of mental growth of feeble-minded individuals have given impetus to studies purporting to compare the learning ability of feeble-minded and normal individuals. Contrary to expectations, such studies have not revealed any consistent superiority of normal individuals in learning situations. Rather, normal individuals have been found, in general, to excel in certain types of learning tests (those requiring considerable "abstraction" and generalization), while feeble-minded individuals have been found to be superior in learning tests placing a premium upon motor facility and memorization (18, 25).

Comparison of the Cognitive Processes of Feeble-minded and Normal Individuals.—There have been a variety of attempts to study the thinking process of normal and feeble-minded individuals. Drawing performances have been utilized frequently. It has been found by different investigators that feeble-minded individuals, when given a drawing task, tend to include more details than normal individuals, but fail to coordinate and integrate the drawing as a whole (6, 9). Free-association tests, language-usage tests, tests of abstract- and concrete-mindedness (such as various types of classification tests) have also been used to compare the thinking and problem-solving processes of feeble-minded individuals with those of normal individuals (2, 3, 20). A majority of the studies point to a greater degree of abstract-mindedness of normal individuals and a greater degree of concrete-mindedness of feeble-minded individuals. Related findings indicate a greater preoccupation with immediate details in feeble-minded individuals and with relatively little integration of subactions with general plans.

The Explanatory Power of the Theory of Rigidity.—One criterion of the scientific value of a theory is its explanatory power. In general, the better the theory, the more can it be used in explanations of different types of events. The number of events that can be explained by a theory is equal to the number of testable theorems that can be logically derived from its set of postulates. The explanation power of the rigidity theorem is indicated by the sample theorems that were derived, and its correctness is supported by the experimental results that were in agreement with the predictions. Does postulating that the degree of rigidity is proportional to chronological age, and hence to the degree of feeble-mindedness for any given mental-age level, also enable one to explain the findings of other investigators?

It seems possible to apply the rigidity theory to the findings indicated in the preceding section. For example, the proposition in Theorem 3 is consistent with the findings that there is a tendency for the vocabulary test to be easier for a feeble-minded individual with a certain mental age than for a normal individual with the same mental age and that the test requiring the testee to make a sentence from three words is easier for the normal person. Thus, the degree of differentiation in the language area (number of words known) tends to be larger but the "independence" of these words is greater in the case of the feeble-minded, as indicated by his lesser ability to combine and integrate these words into a sentence.

Another example may be cited from tests requiring the person to "draw a man." The feeble-minded person includes as many, if not more, details (has the necessary differentiation and knows the various parts) but does not relate one part to another. This results in his drawing a man that is defective in proportion. We would say that he is not influenced by the background region (man-as-a-whole) while in a part region (drawing the face). It seems, then, that the results of other researches are not only consistent with the theory of rigidity, but might be economically explained with the aid of the theory. (This does not mean, of course, that the theory of rigidity is the only acceptable one—it merely indicates that it is a fruitful one.)

Does the theory possess explanatory power in relation to observations other than the kind cited above? An observation that has puzzled researchers is that, starting at the same mental age, a feeble-minded person shows a slower rate of mental growth than a normal child (advances in mental age at a slower rate). It appears that the rigidity theory makes possible an explanation of this phenomenon: (*a*) Rigidity makes the occurrence of change more difficult (note cosatiation). Assuming that mental growth involves change, rigidity thus operates to retard the rate of growth of individuals who are more rigid. (*b*) Assuming that environmental differentiation plays a role in mental growth and generalizing from Theorem 2, one concludes that the same situation is less "stimulating" for a feeble-minded individual than for a normal individual. The normal individual is more likely to be in an overlapping situation—to be simultaneously influenced by more than one set of environmental regions. It follows that the same physical environment will have a smaller total of coexisting differentiations in the case of a feeble-minded individual than in the case of a normal individual placed in that environment. (*c*) Assuming that integration and restructuring (reorganization) play a role in mental growth, one is enabled to derive the slower rate of mental growth of the feeble-minded individual from the theorems dealing with the difficulty encountered by a feeble-minded person in the processes of integration and restructuring.

Theory and speculation are not synonymous. The former is necessary in a science, the latter is to be avoided. Continued experimentation and conceptualization is required in order to advance the science of child behavior and development. The theories, however, should aim at lack of ambiguity, permit one logically to derive definite theorems, and enable one to test them by devising experiments aimed at supporting or negating predictions made in the theorems.

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CHAPTER XII

GROWTH OF THE CHILD AS A WHOLE

Willard C. Olson and Byron O. Hughes

Introduction and Problem

Historically there have been two basic, systematic limitations to the portrayal of a coherent story of child growth and development. A limitation has been imposed upon data and generalizations by examining large groups of children on a single occasion, thus obscuring, except by statistical inference, the life history of any given child over a significant age span. The second limitation has been the tendency to break down the data collected so as to study one attribute at a time without much consideration of interrelationships. Thus, we have had detailed studies of height, weight, dentition, mentality, vascularity, achievement, metabolic rate, body build, and interests, to mention but a few. Sometimes these, in turn, have been broken down by analysis. Reports of this type add greatly to a basic structure of a science of development. When, however, one becomes interested in living human beings, measured structures and function may be regarded as changing expressions and samples of a total organism which, in its own right, has unique characteristics. Are there, then, generalizations which are molar as well as atomistic in character?

In the year 1930–1931 at the University of Michigan a laboratory school was established with the study of child development as one of the major purposes. The process of collecting longitudinal data from the multiple-discipline point of view was begun at once and has been carried on continuously since. The schedules which were established sample the child in various ways so as to secure evidence on intellectual, physical, social, and emotional growth. In addition to standardized and well-recognized techniques, various supplementary means were employed in order to have a record of the perturbations that were introduced into the lives of the children and to secure evidence on social and emotional behavior as an aspect of total growth. An extensive collection of journal material, parent interviews, personality ratings, and medical records add to the possibilities of interpretation of the interrelated character of experience and growth. Some of the results are being prepared currently for monograph presentation (4). The present material is largely in the nature of a preview.

Choice of Units

When one attempts to achieve *simultaneity* in the study of various qualitative aspects of child development one encounters the difficult problem of a choice of units for description. There are theoretical or practical objections to most methods that have been proposed. The writers have chosen one of the simpler ways at this stage of their investigations. Each measure is converted into an age value. The age principle has long been used in the statement of mental and educational test results. Under this plan, one may also refer such diverse things as height in inches, weight in pounds, number of teeth erupted, and strength of grip in kilograms to a common scale and speak of height ages, weight ages, dental ages, and grip ages. Scales for appraising the ossification of the hand and wrist bones use the method of matching an X ray with a typical sample to yield carpal age. The use of an age unit does not carry with it any necessary assumptions as to standards or norms and is best understood in terms of operations.

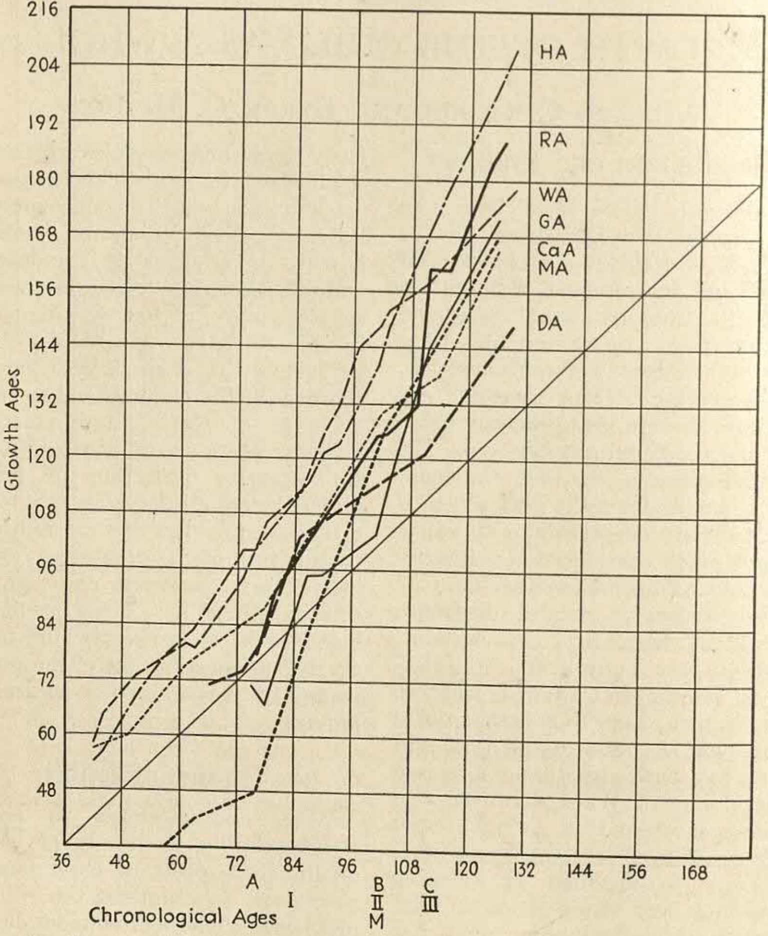

FIG. 1.—Contrasted growth in height age (H.A.), reading age (R.A.), weight age (W.A.), grip age (G.A.), carpal age (Ca.A.), mental age (M.A.), and dental age (D.A.) may be observed for two girls described in Figs. 1 and 2.

The writers have compiled a manual (3) to assist in the translation of physical measures into age units. In other instances various investigators have supplied material in appropriate manuals.

Some of the measures used with abbreviations and an indication of the origin of the age values are given in Table 1.

Treatment of Data

The application of the method will become clearer by illustration. Let us assume that we have measured certain

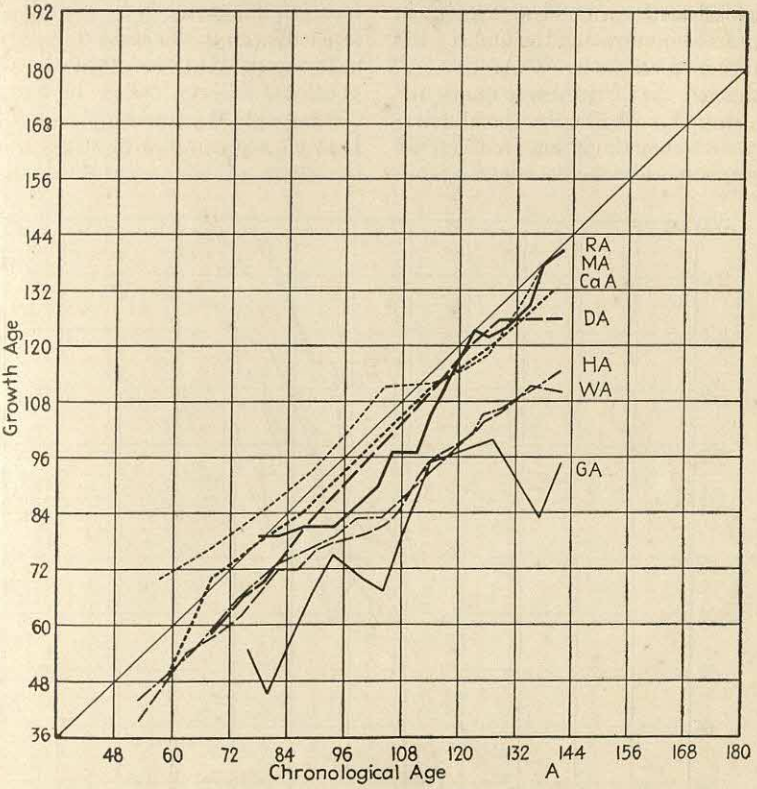

FIG. 2.—See legend for Fig. 1.

functions, as given in the first column of Table 2. The raw scores are given in the second column, the abbreviation for the corresponding age in the third, and the age equivalent in months in the fourth.

The accelerated nature of the growth of girl *G*1, viewed as a whole, can be determined by comparing each age value with the chronological age of 108 months. The term "organismic age" was coined to represent the average of

TABLE 1.—KEY TO AGE UNITS

Measure	Abbreviation	Reference
Mental age	M.A.	Kuhlmann-Binet
Reading age	R.A.	Gates and Stanford
Educational age	E.A.	Stanford
Height age	H.A.	Baldwin
Weight age	W.A.	Baldwin
Grip age	G.A.	Baldwin and Meredith
Carpal age	Ca.A.	Flory
Dental age	D.A.	Cattell
Social age	S.A.	Doll
Developmental age	De.A.	Furfey and Sullivan
Organismic age	O.A.	Olson and Hughes
Chronological age	C.A.	Calendar

all age values for a child at a point in time. In the illustration the O.A. of 138 months exceeds the C.A. by 30 months and the "organismic quotient" (O.A. ÷ C.A.) is 128. In the illustration, an average deviation (A.D.) of all the measures about the central tendency (O.A.) has been calculated and found to be 11.7 months. The measure of *heterogeneity* or *homogeneity* will figure in various interpretations in relation to parental, familial, and maturational factors in the complete studies but will not be utilized in the following descriptions. The following generalization may be made: *The variability of the values for a given individual is typically less than that for a whole age group of children.*

It should be noted that the unconventional liberty taken in averaging diverse data is based on the hypothesis that *all* are samples of structures and functions of the organism and that different individuals may be organismically equal while having different patterns.

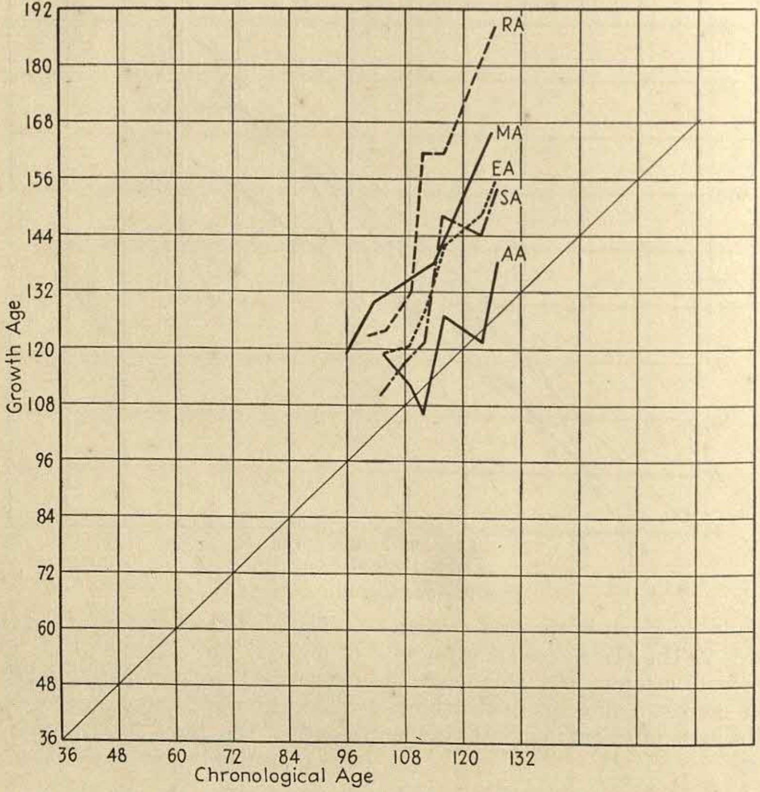

FIG. 2*a*.—A child's growth and achievement show a "going togetherness." Figures 2*a* and 2*b* give the details of educational age (E.A.), spelling age (S.A.), arithmetic age (A.A.), and reading age (R.A.) for the children of Figs. 1 and 2. Other details of achievement such as language usage and literary acquaintanceship are similarly differentiated in the two children.

Illustrative Growth Curves

We have utilized 28 boys and 28 girls with longitudinal records from 5 to 8 years in length. An interesting way to view these records in our atlases of

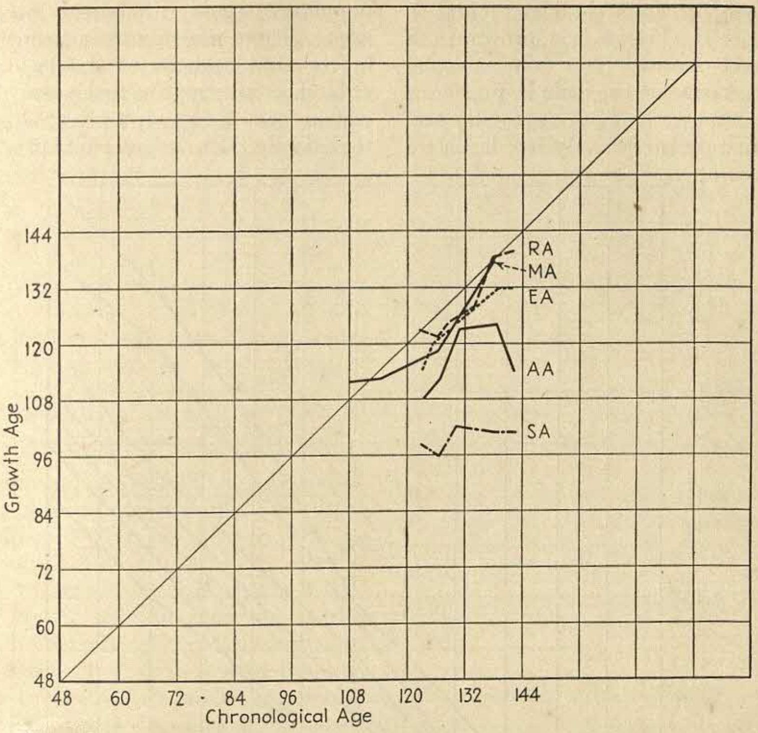

FIG. 2*b*.—See legend for Fig. 2*a*.

development is to arrange them in order of organismic age as of a common period of time. We have arranged our series in the order of organismic age as of nine years of chronological age. When for purposes of contrast one views the highest boy and highest girl and the lowest boy and the lowest girl in the series, one secures a most dramatic picture of the generalization that growth tends toward unified patterns.

Growth curves for *G*1 and *G*28, the highest and lowest in the series for

TABLE 2.—CROSS-SECTIONAL DATA FOR GIRL, *G*1, AT A CHRONOLOGICAL AGE OF NINE YEARS

Function measured	Raw score	Abbreviation	Age equivalent
Height	60.4 in.	H.A.	160
Reading	28 items correct	R.A.	130
Weight	96 lb.	W.A.	156
Strength of grip	19.7 kg.	G.A.	130
Ossification of hand and wrist	X ray	Ca.A.	135
Mental capacity	Tests passed	M.A.	134
Dental eruption	16 permanent teeth	D.A.	119
Organismic age		O.A.	138
Variability		A.D.	11.7
Chronological age		C.A.	108

girls, are presented in Figs. 1 and 2. The girl in Fig. 1 has grown in a luxuriant manner and has achieved high status while the child in Fig. 2 has grown in a sluggish manner and remained on a relatively low level. *G*1 matured sexually in a precocious manner as indicated on the base line by ratings of pubic hair (I, II, III), breasts (*A*, *B*, *C*), and menarche (*M*), while *G*28 is comparatively retarded. In Table 2 we calculated an organismic age for *G*1 at 108 months as 138. The same calculation for *G*28 yields a value of 95 months. They are separated in organismic age by 43 months, or 3½ years. In random samples of the population these differences are still larger. There are interesting contrasts in the development of the two girls at birth and during the first years of life which are being investigated systematically with larger populations.

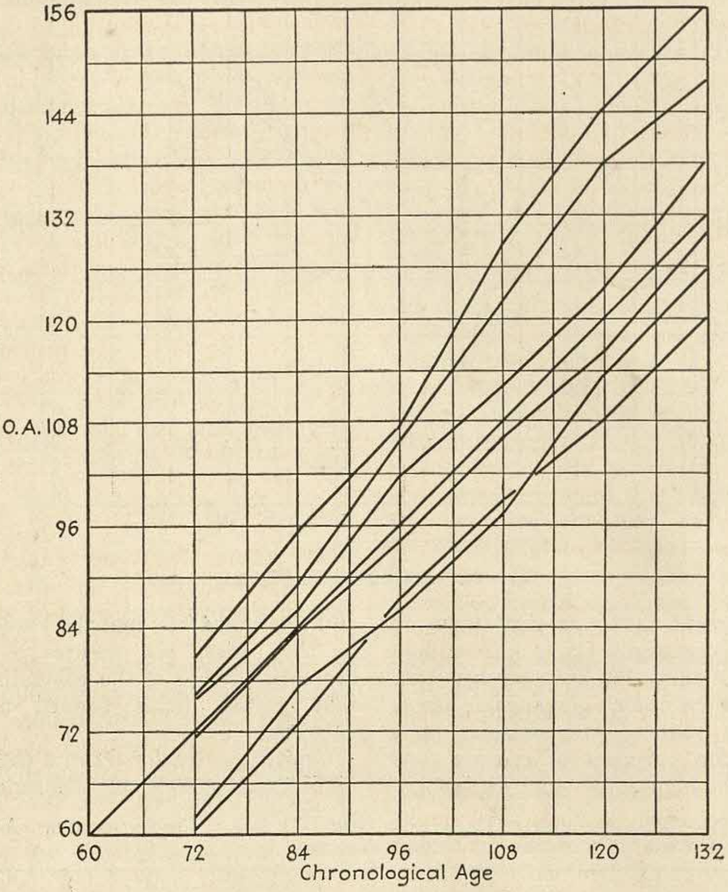

FIG. 3.—Stability of "organismic age" in boys.

Achievement and Growth

The tendency for a trajectory of growth curves to be organized in a somewhat homogeneous pattern will be noted for the two cases. The homogeneity is not confined to the attributes measured and described in Figs. 1 and 2. In Figs. 2*a* and 2*b*, additional details are given for achievement in school subjects. The tendency of achievement to occur within the broad pattern of total growth has led to the generalization, more fully documented in an unpublished study, that *achievement is a function of the organism as a whole.* The level of growth also implies *seeking* behavior within a given environmental supply of educational nurture (2).

Growth in developmental age (De.A.) and social age (S.A.), not reported in the graphs, differs in a similar manner in the children. Unpublished studies suggest that these variables will also tend to mesh with the total pattern.

The Stability of the Center of Gravity of the Organism

When one calculates the organismic age at a series of age points for a child and graphs the result, one obtains typically a line with a slope which is quite uniform throughout the range (Fig. 3). It will be observed in the growth patterns in the illustrations in Figs. 1 and 2 that there are fluctuations of the several values from age point to age point. These fluctuations, however, tend to balance each other so as to leave, in organismic age, a relatively uniform type of increment. One may argue that the straight-line growth found is the result of averaging. It is also true, however, that such data set an hypothesis *that total growth tends toward stable increments which are made up of counterbalancing fluctuations.* Such a concept has been well implemented, for example, in the relation of leg length and stem length to total heights at various periods. Practically, the results mean high accuracy in predicting organismic status at a following age from values obtained at an earlier age. This has certain practical consequences for guidance.

Although the illustrations given do not carry the children far into the puberal period, results not reported here, based on the data of the Harvard Growth Study, suggest substantial correlations between status in organismic age at age ten and at age eighteen.

The Effects of Perturbations upon Growth

Hypothetically, an environmental perturbation may be reflected with greater or lesser immediacy in the various structures and functions that are sampled in attempting to describe the total growth of the child. Figure 4 describes the growth of a child in whom perturbations have been repeated and severe. Clinically this child appears to have been "hammered down" by his environmental shocks. The combination of events shortly after eighty-four months of age results in a very clearly defined departure from the expected prediction of straight-line growth in the case of weight. The analysis of perturbations should be regarded as a problem for technical study rather than a field in which the answers are clear, since unknown factors frequently complicate the interpretations.

Study of Siblings

The siblings available to our study show a high degree of similarity in the pattern of growth. Longitudinal studies which compare siblings at the same age are methodologically superior to resemblance reports comparing children of dissimilar ages. Twin studies have always had the advantage of simultaneity. The illustration employed (Fig. 5), for brothers born thirty-three months apart, shows striking similarities in level and pattern for the six variables. The striking dip in weight age when each became about eight years of age emphasizes a pattern similarity which would be rather completely concealed by the usual correlational methods.

Growth, Affect, and Behavior

When growth fails to maintain itself at a steady rate and sags, as it does in Fig. 6 between the ages of seventy-two months and eighty-four months, one may expect associated emotional disturbance and social maladjustment. This was observed clinically in a series of cases in the laboratory schools and has now been confirmed systematically and quantitatively in a doctoral dissertation by Mary Elizabeth Mechem (1). Research on the association of growth and social and emotional disturbances is not at a point where one can readily ascribe causes or decide with certainty whether faulty growth produces the disturbance in feeling and behavior or whether environmental factors and emotional disturbances produce the faulty growth. Probably neither can be called antecedent or consequent. It is probable that both are interrelated and circular and practical programs of treatment had best be pluralistic in methods of attack.

The Child in the Social Field

In this chapter we have emphasized individual growth rather than social relationships. However, preliminary work on social groups suggests that the maturity expressed in organismic age has an important relationship to acceptance and rejection and to the ability to be in the center as contrasted to the periphery of a social organism. These studies are still in process but suggest that neither the individual nor

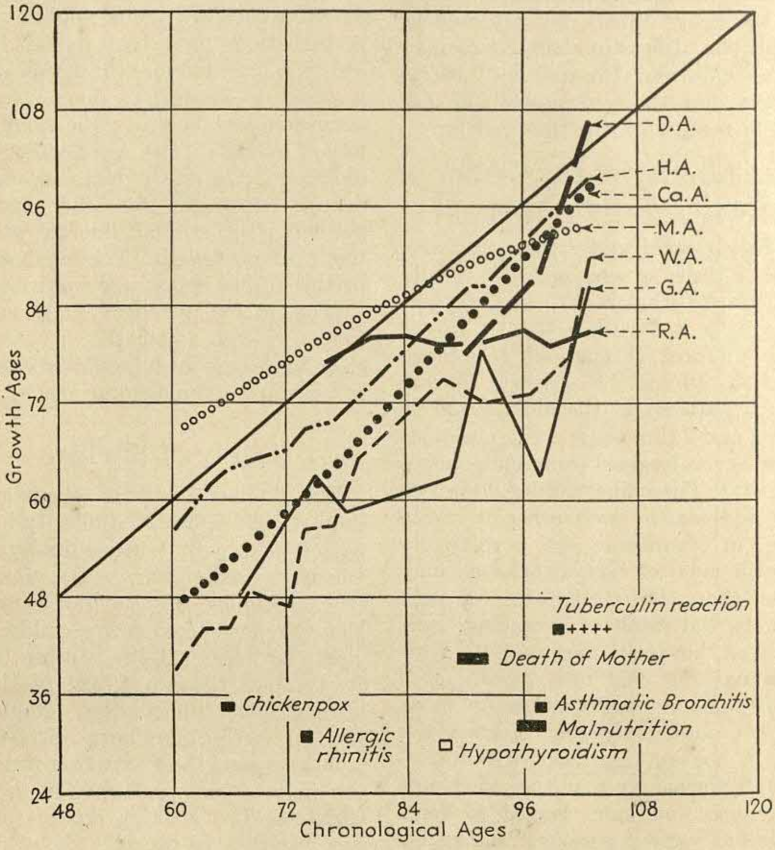

FIG. 4.—The effect of "perturbations" on growth is an interesting and important field for systematic study.

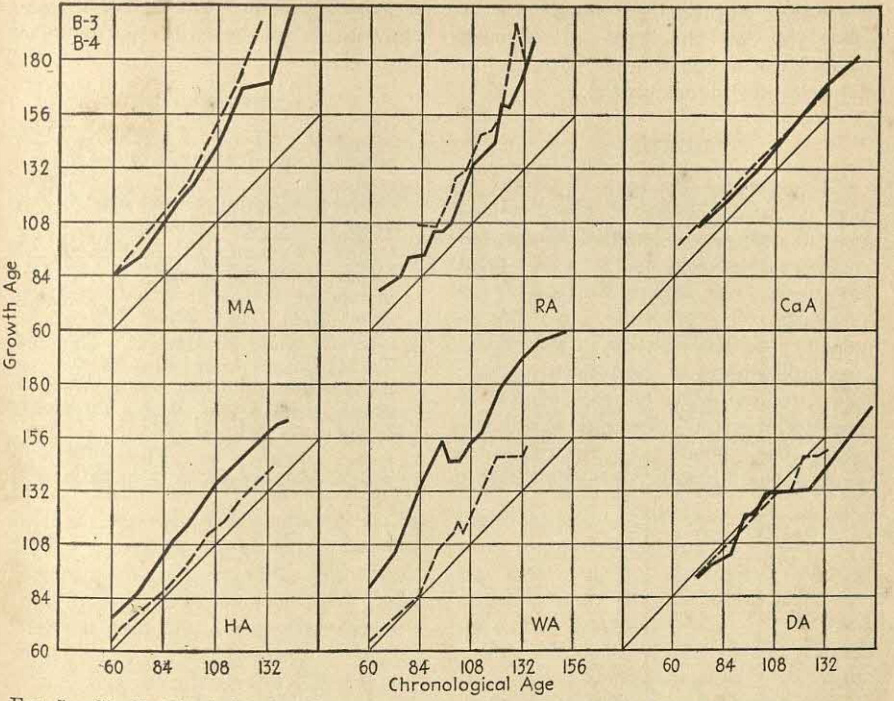

FIG. 5.—Similarities in level and pattern of growth in male siblings born 33 months apart.

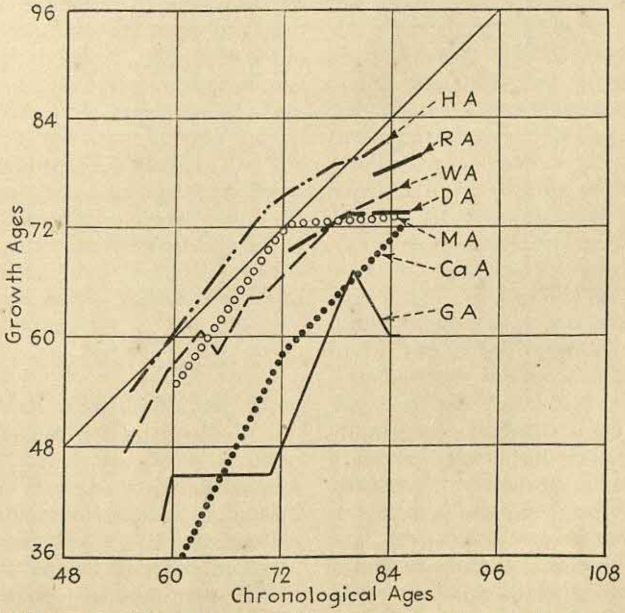

FIG. 6.—Disturbances in affectivity and social adjustment coincide with failure to maintain a steady increment of growth.

the social approach in itself will be adequate for the type of account needed for a broad understanding of behavior and development.

Summary

The age unit has been employed to permit various types of physical and mental data to be studied simultaneously as expressions of the total organism. The report illustrates the concepts of organismic age; homogeneity; achievement as a functional accomplishment of the total organism; the predictability of the center of gravity of growth through successive ages; the effects of perturbations; sibling resemblance; interrelationship of growth, affect, and behavior; and the relation of the child to the social field.

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CHAPTER XIII

LEARNING AND MATURATION IN IDENTICAL INFANT TWINS: AN EXPERIMENTAL ANALYSIS BY THE METHOD OF CO-TWIN CONTROL[*]

ARNOLD GESELL AND HELEN THOMPSON

One purpose of this volume is to show the nature of scientific methodology. In the present chapter we shall be concerned with twins as method rather than with twins as subject matter. In recent years multiple births have received so much attention that the study of twins has attained almost the status of a subscience. The Index Medicus and the Index Catalogue of the Library of the Surgeon General's Office list hundreds of books and articles on twinning, both in its normal and in its abnormal aspects. Taruffi wrote a monumental work on teratology which devotes 1,650 pages to the consideration of double monsters alone. H. H. Newman has spent many years investigating the biology and physiology of twinning in both man and the lower animals (17). An historical landmark in the psychological study of twins is a paper by Sir Francis Galton (1876) entitled: *The History of Twins as a Criterion of the Relative Powers of Nature and Nurture.*

Origin of the Method of Co-twin Control

Our own studies of twins have a point of departure similar to that of Galton's paper. We used a pair of twins to explore experimentally the interrelations of learning and growth. These interrelations lie at the basis of the so-called "nature-nurture" problem. For some time we had been interested in the remarkable correspondences both physical and mental exhibited by identical twins. These correspondences were highly interesting in themselves; but what did they signify? What was the origin of the identities and disparities of similar twins?

The biologist would prefer to call such twins "monozygotic" or "one-egg" twins, because it is possible even for twins derived from a single egg cell to be extremely nonidentical. Twinning is a process of bilateral doubling. In some measure this process is also manifested in the genesis of the single individual derived from a single zygote, producing his paired organs and the right and left halves of his unpaired organs. He, the singleton, is a product of developmental duplicity. In the case of true, complete monozygotic twins, this process of duplication is carried to such a degree that two offspring result from the single ovum. A perfectly symmetrical bilateral individual, on the one hand, and a perfect pair of duplicated individuals, on the other, represent the ideal extremes of the process of twinning. Between these extremes there are many gradations and deviations, some of them benign, others monstrous, in character. With abnormal conditions even a monozygotic twin may lack all semblance to a co-twin.

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[*] Adapted with permission of *Genetic Psychology Monographs.*

A study of Twins *A* and *B* (8) showed that resemblances in the psychological sphere could be as thoroughgoing and detailed as those in the somatic and physiological. A significant comparison of the Twins *A* and *B* was made possible by means of the Stanford vocabulary test. This test Terman considers to have a higher value than any other single test in the entire intelligence-measuring scale. The test consisted of 100 words derived by random selection from a dictionary containing 18,000 words. An abbreviated series of 50 words of increasing difficulty ranging from *gown* and *tap* to *shagreen* and *complot* was given to both *A* and *B*. This virtually constituted a graded scale of 50 individual tests. A startling degree of resemblance was revealed. Twin *A* failed on 16 of the test words; *B* failed *on exactly the same words*, and on only one additional word, *viz.*, harpy. The calculated vocabulary score of Twin *A* at the age of nine was 65 and for Twin *B* it was 67, a standard equivalent to the average adult level. (Both twins earned an intelligence quotient of over 180 at the age of seven years.) This degree of correspondence is truly remarkable when we reflect that the vocabulary test in a statistical sense encompasses the whole wide domain of the English language.

We often regretted that we had not been able to study these exceptionally interesting twins in their infancy. In 1928, however, we were given an unusual opportunity to satisfy our curiosity concerning the infant aspects of development in another pair of twins, also highly similar. It happened that the mother of a pair of fair-haired Italian twins had died when they were a month old. This necessitated the removal of the twins to a child-caring institution. This made it possible to keep them under systematic observation. The twins were virtually indistinguishable in physical appearance. By ordinary observation they were also extremely alike in their patterns and modes of activity. Once more we were intrigued by the phenomena of similarity.

We made repeated physical and mental measurements at six, eight, sixteen, twenty-four, twenty-eight, thirty-two, thirty-six, thirty-eight, forty, forty-two, and forty-four weeks of age. We were so engrossed with the study of similarities that we almost overlooked the potential significance of twins as methodology.

But when the twins were about nine months of age we said to ourselves, "Why not capitalize these remarkable similarities and utilize them for making an experimental analysis of the developmental processes which are producing such impressive correspondences?" We shifted our angle of approach and outlined a method of comparison which we later designated "the method of co-twin control."

The twins were rebaptized alphabetically. Almost at random we selected one twin for differential training in specific functions—Twin *T* (*T* = trained twin). The co-twin was reserved as a comparative control. She was not trained or stimulated in the specific functions. We called her Twin *C*.

By extraordinary good fortune we have been able to maintain investigatory contact with these twins over a period of 14 years. Throughout this period numerous comparisons were made, Twin *C* being consistently reserved as a standard for comparison. We sought light on the origin and fate of individual differences which we experimentally produced through the device of limiting certain types of specific training to one twin, Twin *T*.

The Principle of the Method of Co-twin Control

A brief statement of the nature and philosophy of the method of co-twin control is in order at this point. In essence the method consists in using the complexities of one individual to elucidate the complexities of another under highly controlled conditions; *i.e.*, differential training in some specific function is confined to one of a pair of identical twins whose behavior before training is highly similar. By comparing the twins at the end of such a training period, we can determine how effective the imposed training has been in modifying what would have been the natural behavior of the twin. We are able, in effect, to compare the individual with himself as he would have been if not trained.

The student who thinks that the validity of scientific findings depends upon large numbers of cases may look askance at a method confessedly so limited. He may read with sympathy M. Meyer's statement, "A description of one individual without reference to others may be a piece of literature, a biography or a novel. But science, No!"

We escape this stricture because we undertook to describe one individual with scrupulous reference to another, *viz.*, Individual *T* in terms of Individual *C*. We might even claim an extra measure of science in this approach, because we have used for our control a standard of measurement which is at once quantitative and organismic. Statistical norms and devices can never be organismic because they are either heterogeneously unselected or homogeneously selective and must therefore remain analytic and partial in application. But a co-twin control is by definition highly identical with the individual under investigation. He is the synthetic sum of a statistically numerous multitude of forces. He is an embodied quantity who with respect to any distinguishable trait is more or less than the investigated individual.

A control co-twin has had a highly equivalent prenatal and postnatal life career, except for divergences which are experimentally created and recorded or naturalistically observed. When one contemplates the almost infinite number of variables which enter into the shaping of any life career, it must be granted that an "identical" co-twin who brings these variables into finite and manageable range is indeed an extraordinarily powerful statistic in his own integral person. His individuality is unique but by definition it is almost a replica of the individuality which is being assayed.

The patterns of twin and co-twin do not exactly superimpose, but by matching we measure. We expose areas and directions of discrepancy. The basic correspondence of the datum and the mensurational criterion gives augmented biometric significance to all discrepancies which can be defined and accounted for.

In this chapter we shall give special attention to the original experiments which were made when Twins *T* and *C* were still infants. In infancy the very intensity and rapidity of the growth processes facilitates an analysis of the relationships between learning and maturation. Before describing these experiments we must reemphasize the methodological significance of the fundamental general parity and the thoroughgoing identities of the twins under discussion.

The method of co-twin control requires that a basic parity and identity should be established by careful measurements *prior* to the period of comparative observation and experiment. This requirement is essential because one twin is used as a standard of comparison and almost as a metric unit to ascertain degrees of resemblance and discrepancy. H. H. Newman in an interesting chapter on the psychology of twins has called attention to the importance of this aspect of the method of co-twin control. He writes as follows:

> Who has not heard of the New York twins, Johnny and Jimmy . . . ? One of these twins, we don't remember which and it doesn't matter, was trained to be a little gentleman and the other allowed

to grow up like Topsy. As time went on they became very different in motor skills and in social behavior. This would have been an excellent case for testing the effects of different environment and training on two individuals alike in their heredity, except for one defect in the setup. Johnny and Jimmy turned out to be a pair of two-egg twins! So the co-twin-control feature was entirely lacking and therefore the experiment was meaningless. It is to be hoped that future experimenters in this field will be more careful in their selection of twins, for unless one-egg twins are used it is impossible to distinguish hereditary from environmental effects (17, p. 145).

This methodological requirement was amply fulfilled in the case of *T* and *C*. Daily determinations of weight and temperatures and frequent measurements of height and body diameters, periodic observations of dentition, and records of the skin patterns yielded evidence of a remarkably stable developmental correspondence with respect to physical characteristics (see Fig. 1).

The reaction of the twins to simultaneous infections, including an acute intestinal intoxication, and their reactions to multiple transfusions in an almost fatal illness demonstrated a deep-seated similarity in biochemical constitution. Periodic inventories of behavior patterns both by cinema and by the Yale Developmental Schedules showed an equally pervasive correspondence in the patterning of behavior. At the age of forty-six weeks they had arrived at virtually the same level of maturity with respect to both mental and physical characteristics. At this age both twins were at the threshold of climbing ability. This was a particularly favorable juncture for initiating a training program designed to make Twin *T* an expert in stair climbing. There were no staircases in the institution for *C* to climb. Therefore she was for the time being denied all specific experience in stair climbing. This experimental differential gave *T* a double advantage, particularly since she was from the beginning very slightly accelerated in her general motor development.

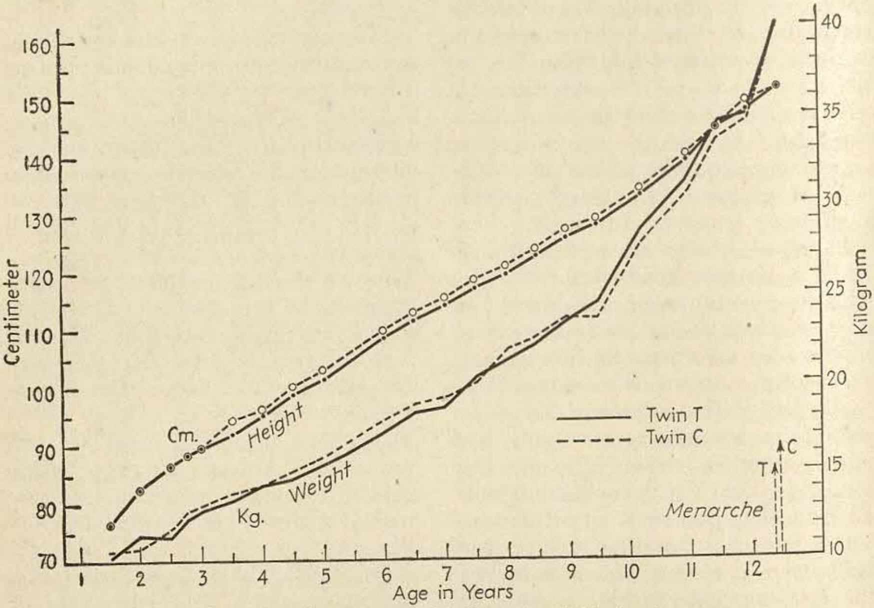

FIG. 1.—Comparative height and weight chart.

The Stair-climbing Experiment

The Training Period.—The purpose of the experiment was to investigate the effects of daily training upon the locomotor behavior of *T*, measuring these effects by comparison with the untrained co-twin, *C*, who was used as a control. Every morning for 6 days a week over a 6-week period, beginning when she was forty-six weeks old, *T* was given definite stimulation and guidance in the following locomotor activities: (*a*) stair climbing on the four-tread staircase leading to the crib; (*b*) creeping for an interesting object placed at a near enticing distance; (*c*) pulling herself to a standing position; (*d*) walking by holding on a chair or crib; (*e*) walking by holding experimenter's hand. Of all these activities, stair climbing was under the most complete training control. Accordingly, after the first 3 days, an attempt was made to entice *T* to climb the stairs as many times as possible, the experimenter using her judgment as to when it would be unwise to press the stair-climbing feat. Each training period lasted for 10 min.

Comparisons of the behavior of the twins were made at various stages of the primary experimental period. At the end of this period, at the age of fifty-two weeks, the results proved so interesting that it was decided to widen the range of comparison by subjecting the control twin, *C*, to a brief course of training in stair climbing. This course began when Twin *C* was fifty-three weeks old, continued 6 days a week for

TABLE 1.—RELATIONSHIPS OF AGE AND TRAINING

T and C at forty-six weeks (*T*,46; *C*,46). There is essential parity of *T* and *C* in all fields of behavior, including locomotion. Both pull self to standing position, creep with equal facility, walk when held by two hands. Both are at the threshold of climbing. Each lifts one foot at the first tread of the staircase, but does not ascend. In several comparative examinations through the period, from 6 weeks to 46 weeks, *T* showed slightly more advanced bodily activity and postural control.

T and C at forty-eight weeks (*T*,46 + 2*t*; *C*,48).—No perceptible difference in walking and lowering. Both show same initial tendency to scale steps by placing knee on first tread. Both need initial assistance to surmount first tread. *C* goes no farther. *T* climbs five steps with further assistance. (Time: about 40 sec.)

T and C at fifty-two weeks (*T*,46 + 6*t*; *C*,52).—Equal eagerness to stand. Both stand alone momentarily, *T* slightly superior. Equal in creeping ability. *T* lowers self slightly better. *C* makes initial attempt to mount steps, placing left foot squarely on first tread. *T* slowly mounts five steps. (Time: 26 sec.)

T and C at fifty-three weeks (*T*,46 + 6*t*; *C*,53).—Although untrained, *C* now climbs the entire staircase, unassisted, in 45 sec. On the following day this time fell to 40 sec. *T* climbs in 17 sec., leaning and pulling self forward more than *C*.

T at forty-eight weeks and C at fifty-five weeks (*T*,46 + 2*t*; *C*,53 + 2*t*).—Both have now had just 2 weeks of training in climbing. *C* climbs more vigorously and much more rapidly. (Time: *T*, 40 sec.; *C*, 10 sec.) *C* climbs without assistance. *T* for the first time climbs without assistance. Two weeks of training have been markedly more efficacious for *C* at 53 weeks than for *T* at 46 weeks.

T at fifty-two weeks and C at fifty-five weeks (*T*,46 + 6*t*; *C*,53 + 2*t*).—At these stages both climb in a similar manner but *C* is more rapid. *C* also walks better than *T* when supported with one hand. Although trained three times longer (6*t* *vs.* 2*t*), and 7 weeks earlier, this advantage is more than overcome by 3 weeks of added age. (Time: *T*, 26 sec.; *C*, 10 sec.)

T and C at fifty-six weeks (*T*,46 + 6*t* + 4; *C*,53 + 2*t* + 1).—Both ascend steps with ease, *T* in 11 sec.; *C* in 14 sec. (cinema record). *T* takes one step alone. (*T* walks alone at 58.5 weeks; *C* walks alone at 60.5 weeks.)

T and C at seventy weeks (*T*,46 + 6*t* + 18; *C*,53 + 2*t* + 15).—*T* is slightly more agile in climbing, slightly faster, and more confident in walking. Under excitement *T* climbed steps in 6 sec.; *C* climbed steps in 10 sec.

T and C at seventy-nine weeks (*T*,46 + 6*t* + 27; *C*,53 + 2*t* + 24).—Walking performance in both twins is now highly similar. Bodily equilibrium similar. Activity greater in *T*. *T* more agile in climbing, but speed similar. *T* climbs stairs in 7 sec.; *C* climbs stairs in 8 sec. (see Fig. 3).

2 weeks, each session being 10 min. long.

The purpose of this special training period was to check the results of the previous experiment by determining the trainability of Twin *C* at a more advanced age than Twin *T*.

Comparative Results.—At forty-six weeks, just before the training period began, the twins behaved as follows when placed before the experimental staircase. Each twin lifted one foot, but neither went further in an effort to climb. On the floor they crept with equal facility. Each walked if held by both hands. Each pulled herself to standing position. There was no apparent difference between the twins in locomotor performance.

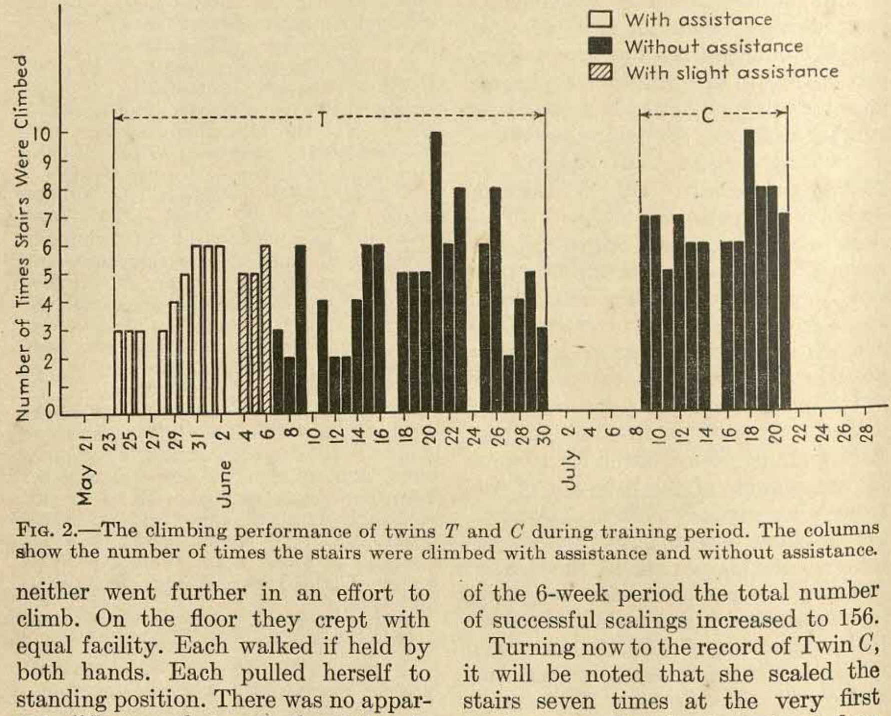

FIG. 2.—The climbing performance of twins *T* and *C* during training period. The columns show the number of times the stairs were climbed with assistance and without assistance.

Table 1 and Fig. 2 indicate the climbing behavior of Twin *T* during her training period, which lasted from forty-six to fifty-two weeks, and of Twin *C* during her training period, which lasted from fifty-three to fifty-five weeks. It will be noted that in the early stages of the training period, *T* mounted the stairs only three or four times during the 10-min. session, with fluctuations which could be clinically explained. Well-defined enjoyment in climbing came into prominence in the fourth week. The number of successful scalings per session increased, until it reached the maximum of 10 on the twenty-fifth session during the fifth week. This record may be taken as representing the peak of her performance, regarded from the point of view of spontaneity and of speed. All told, she had, at this particular session, scaled the stairs 115 times. At the end of the 6-week period the total number of successful scalings increased to 156.

Turning now to the record of Twin *C*, it will be noted that she scaled the stairs seven times at the very first session, *even though she had not been trained at all.* Her maximum record of 10 successful scalings was reached in 1½ weeks, at the ninth session. It took her from 10 to 18 sec. to make each successful mounting of the stairs. This speed is approximately equal to that of Twin *T*, who did not, however, attain that score until 5 weeks of training had elapsed. It will be noted that, all told, *C* scaled the stairs 81 times in a period of 2 weeks as contrasted with *T*'s record of 55 times in the first 2 weeks and of

156 times in 6 weeks. The ratio of total performance (scalings) to total duration (weeks) in the case of *T* is as 26 is to 1; the ratio of performance to duration in Twin *C* is as 40 is to 1—a palpable difference in favor of the efficiency of deferred training (Fig. 2).

Perhaps the most striking event which happened during the course of this investigation was the successful climbing of the stairs by Twin *C* at the age of fifty-three weeks, without previous specific training and without any environmental opportunity to exercise the function of climbing. When the stair-climbing behavior of the twins is compared for their 56-week performance, (after *T* was trained for 6 weeks, *C* for 2 weeks), it appears that on a first trial *T* climbs the flight of stairs in 11.3 sec., *C* in 14.8 sec.; but that on a second trial *T* climbed in 13.8 sec. and *C* in 13.9 sec., an almost identical performance.

A general comparison of speed of performance indicates that *T*, at the age of fifty-two weeks after 6 weeks of training, climbed the staircase in 26 sec. Twin *C*, at the age of fifty-three weeks and without any previous training, climbed the same staircase unaided in 45 sec. After two weeks of training, at the age of fifty-five weeks, *C* climbed in 10 sec.

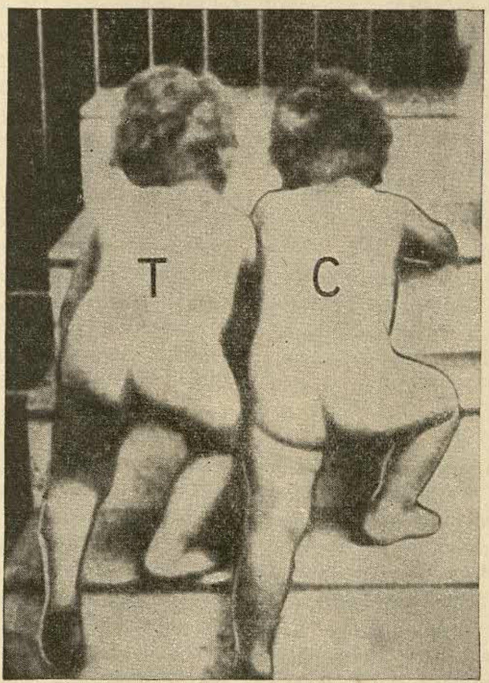

Fig. 3.—Stair-climbing behavior of twins *T* and *C* at 79 weeks, showing similar postural adjustments.

The climbing performance of Twin *C* at fifty-five weeks was far superior to the climbing performance of Twin *T* at fifty-two weeks, even though Twin *T* had been trained 7 weeks earlier and three times longer. The maturity advantage of three weeks of age must account for this superiority.

An analysis of the influence of locomotor training in relation to age and growth is presented succinctly in Table 2.

Suggestive interrelations of varying degrees of agedness and varying dosages of training (in climbing) are summed up in the following formulas, in which numerals denote duration or age in weeks; t denotes training; T, Twin T; C, Twin C.

$(T46)$ approximates $(C46)$.
$(T46 + 2t)$ slightly exceeds $(C48)$.
$(T46 + 6t)$ exceeds $(C52)$.
$(T46 + 6t + 1)$ exceeds $(C53)$.
$(C53 + 2t)$ exceeds $(T46 + 2t)$.
$(C53 + 2t)$ exceeds $(T46 + 6t)$.
$(C53 + 2t + 1)$ approximates $(T46 + 6t + 4)$.
$(T46 + 6t + 27)$ approximates $(C53 + 2t + 24)$.

Most significant is the simple fact that Twin C, when her time was ripe, climbed the stairs altogether without tuition. Of similar significance is the fact that Twin T's response to early training was indifferent and impassive. Not until the fiftieth week did she seem in full possession of a climbing proclivity. It should also be noted that the early form of the behavior pattern for climbing was somewhat distinctive for Twin T because it was grafted on creeping rather than on walking. Her climbing was a creeping upward rather than an ordinary mounting. This observation suggests that the form as well as the incidence of behavior pattern is governed by existing neural counterparts, determined by maturational factors.

Summary.—In scientific work it is always somewhat hazardous to expand the findings of a concrete study into sweeping generalizations. It may well be that the relationships of learning and growth that are suggested by the stair-climbing data are limited to gross motor functions such as locomotion, which is common to the species. It will therefore be wise at this stage to formulate the conclusions with due parsimony and to limit them to stair-climbing behavior. So limited, the conclusions may be summarized as follows:

1. These findings point consistently to the preponderant importance of maturational factors in the determination of infant behavior patterns.
2. There is no conclusive evidence that practice and exercise even materially hasten the actual appearance of types of reaction such as stair climbing.
3. The time of appearance of simple locomotor behavior patterns appears to be fundamentally determined by the ripeness of the neural structures.
4. Learning appears to be profoundly conditioned by the factors of maturity. Training does not transcend maturation. Maturation, however, tends to supplant or modify the results of training.
5. The form as well as the incidence of behavior pattern is governed by existing neural counterparts, determined by maturational factors.

The time values included in this section were recorded by the stop watch, which was sufficiently accurate for the purposes of the study. At the end of a 2-year period we were in possession of numerous cinema recordings which could be subjected to refined analysis to determine more precisely the time values of the behavior patterns which constituted the stair climbing at various stages of maturity.

Comparative Determinations by Cinemanalysis

Cinemanalysis is a method of behavior study. Since the student is interested in method it is well to pause here to consider the scientific value of cinemanalysis as a psychological tool for the study of the forms and trends of behavior. Its value as a tool rests upon three paradoxes:

1. The cinema embalms behavior by fixating it in chemical solution and then reanimates it in all its original integrity.
2. The cinema captures motion by stilling it. (This harks back to the

ancient sophism of Zeno, who held that an arrow could not take flight, because at any given moment it was always at rest.)

3. The cinema converts past and future into a present. The flexibility of the film, and the detachability of its records, make it possible to bring remotely separated events into juxtaposition for *immediate* observation and direct comparison. The almost magical manipulability of cinema records thus reinforces not only the visual areas but the association areas of the brain. The cinema of itself bakes us no bread. But the method of cinemanalysis opens up unlimited fields for the brain areas to operate upon.

Cinemanalysis is a research method which capitalizes the three paradoxes to which we have just alluded. The simplest device for accomplishing this analysis is an ordinary projector, mounted on a portable vertical stand, which rests on a desk or table. In the model which we have developed at our clinic, the projector is operated by a small hand crank and throws an image 4 by 5½ in. in size upon a white enameled plate. The operator sits at the table in comfortable and intimate relationship with the image, which he controls by means of a crank.

Let us assume that the projector carries a film which has recorded the prehension of a cube (a red, 1-in. block) by a twenty-eight-week-old infant. The operator can project the record at a normal rate of 16 frames per second. Time and time again he can witness the self-same behavior episode, selecting first this, then that, aspect for intensive or repeated observation. By slowing the crank he can project at the rate of about two frames per second, which renders the behavior in slowed but confluent motion. He may project at the rate of one frame per second and get a succession of intermittent stills. He can, of course, accelerate the rate and speed up the motion. He can always slow down to regain analytic grip on the data under observation. When that grip falters, he simply reverses the crank and inspects the sequence again. If necessary, he can look at the same sequence a hundred times.

Out of the multitude of frames which are under his observational control, he can select those phases of motion which most significantly express the configuration of the behavior. If he wishes to make a permanent record of these distinctive pattern phases, he simply takes a loose leaf from his notebook, places it on the white plate, and traces the image in outline. By thus tracing a well-selected series of such outlines, he inscribes in his notebook a faithful reconstruction of the original behavior. The cinema film has an infallible memory.

Cinemanalysis of the forms and the transformations of behavior can be made quantitative. The film "remembers" time and distance. Each frame represents a lapsed interval of $\frac{1}{16}$ or $\frac{1}{32}$ or $\frac{1}{64}$ sec., depending on the speed of the camera. Each frame is automatically registered by a counter. By reading off the counter, by measuring distances and angles, it is possible to translate the patterns of behavior into time and space values.

The details with which any analysis is made will naturally vary with the objectives of the investigator. Elsewhere (6) we have shown that as many as 360 pattern phases can be identified in an 8-ft. strip of film, consisting of 320 frames, which record 20 sec. of infant behavior. A twenty-week-old infant closes in on a rattle, manipulates it, and drops it. This behavior episode was delineated in eight selected action photographs (frames) corresponding to the entire sequence. To demonstrate the wealth of minutiae we identified individual pattern phases for head, eyes, mouth, arm, fingers, thorax, pelvis, legs, and toes. These phases fall into three categories: (*a*) a critical phase in which the member is at rest or undergoes a complete shift or reversal of movement; (*b*) a kinetic phase when the movement is under way; (*c*) a phase of resolution or culmination when this particular movement is completed or resolved. The grand total of phases for the foregoing episode, as stated, proved to be 360.

It is not suggested that the multiplication of analytic minutiae will in itself advance our comprehension of behavior. But it can be safely stated that there are fundamental problems of behavior form and behavior dynamics which will not be solved until we systematically penetrate those minute manifestations which are made visible only through the microscopy of cinemanalysis. We must be prepared to investigate the phenomena of human behavior with the same searching interest in structured form which the disciplines of human embryology and anatomy demand.

TABLE 2.—TEMPORAL DESCRIPTION OF STAIR-CLIMBING BEHAVIOR IN TWINS *T* AND *C*

Limb moving	Average duration of movement in seconds											
	52 weeks		56 weeks		80 weeks		92 weeks		2 years		3 years	
	T	*C*	*T*	*C*	*T*	*C*	*T*	*C*	*T*	*C*	*T*	*C*
Left foot	1.06		0.93	0.93	0.75	0.87	0.68	0.56	0.62	0.56	0.62	0.62
Pause	+0.25		+0.12	+0.25	+0.12	+0.37	+0.12	+0.18	+0.12	+0.12	−0.25	−0.06
Left hand	0.81		0.56	0.62	0.56	0.62	0.56	0.50	0.56	0.50	0.56	0.56
Pause	−0.18		−0.50	−0.25	−0.31	−0.31	−0.18	−0.06	−0.31	−0.31	−0.18	−0.06
Right foot	1.31		1.25	1.00	0.75	1.06	0.75	0.56	0.68	0.56	0.68	0.62
Pause	+0.25	Only placed left knee on tread. Did not climb.	+0.25	+0.12	+0.12	+0.37	+0.18	+0.06	+0.12	−0.06	−0.18	−0.18
Right hand	0.75		0.56	0.68	0.56	0.62	0.56	0.50	0.50	0.43	0.50	0.50
Pause	−0.18		−0.43	−0.25	−0.12	−0.12	−0.31	−0.12	−0.18	−0.18	−0.18	−0.18
Left foot	1.06		0.93	0.93	0.75	0.87	0.68	0.56	0.62	0.56	0.62	0.62
Whole pattern	3.62		2.62	2.87	2.31	3.12	2.25	2.00	2.00	1.62	1.81	1.87
Pause between sets of limbs.	+0.25		+0.12	+0.25	+0.12	+0.37	+0.12	+0.37	+0.12	+0.12	−0.25	−0.06
	+0.25		+0.25	+0.12	+0.12	+0.37	+0.12	+0.06	+0.12	+0.06	−0.18	−0.18

Cinemanalysis indeed is a kind of dissection which anatomizes the patterns of behavior. It makes the recorded reactions as tangible as tissue. The histologist who looks at a stained section of the thyroid gland through the microscope is no closer to reality than the analyzer who looks at the outlines of a behavior pattern which comes through the lens of the motion-picture projector. Both observers are dealing with problems of morphology. Both observers are inspecting, analyzing, and, if need be, measuring the characteristics of form.

This, accordingly, is a morphological approach to the study of behavior. It is, if you will, an exploration of the structure of the human mind, for the organization of the human mind is faithfully reflected in the very patterns of behavior which are made visible through the chemistry and optics of cinematography. Metaphysically put, the patterns embody the mind!

Comparative Cinemanalysis of Stair-climbing Behavior

The method of cinemanalysis was used to determine the psychomotor tempo and pattern of stair-climbing behavior of Twins *T* and *C* over a 2-year period, from fifty-six weeks to three years of age (1). This analysis showed us two things: (*a*) the remarkably small differences in timing between the stair climbing of Twin *T* and that of Twin *C*, regardless of *T*'s earlier and more extensive training; (*b*) the fact that stair climbing retains a characteristic pattern and tempo, with but slight increase in speed, over a period of many months, until the child eventually walks upstairs as does an adult.

Figure 4 and Table 2 present a limb-by-limb analysis of the stair-climbing behavior of Twin *T* from fifty-two weeks to three years and of Twin *C* from fifty-six weeks to three years. The values are obtained by averaging all cinema records of climbing at each age. These records varied in length from 12 to 88 sec. of recorded behavior at an age, and represented from two to eight ascensions of the entire flight of five steps (counting the crib platform as a fifth step). In ascending even a five-step flight, the infant of necessity exhibits the complete four-limb pattern (left hand and right foot; right hand and left foot) several times. Thus the averages given in the table appear to be representative.

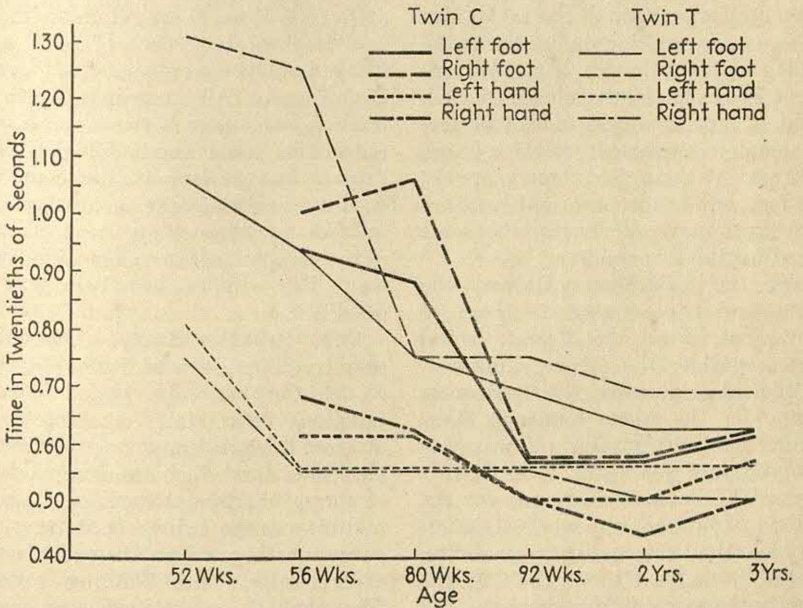

FIG. 4.—Timing for individual limb movements in stair climbing of twins *T* and *C* from 52 weeks to 3 years. (When two lines are drawn in one interval they may be interpreted as being identical.)

The figures in the upper cell of a column (Table 2) indicate the average number of seconds' duration for a movement of the limb in question. The figures in the lower cell indicate the number of seconds between lowering of one limb to the step and the lifting of the next following limb. A minus quantity means that a second limb lifts before a first has come to rest. A plus quantity means that there is a pause between the lowering of one limb and the lifting of the next limb.

Comparison of *T* and *C* in the table reveals striking similarities in the timing of the corresponding actions of the two infants. *At only one age (eighty weeks), does the difference in timing for the four-limb pattern exceed* 0.38 *sec., and at three years not only is the timing for the whole four-limb pattern almost exactly the same* (1.81 *sec. for Twin T*, 1.87 for *Twin C*) *but three of the four limbs take exactly the* *same time (on the average) for movement in the two children.*

In general it is clear that in the case of each twin there is a marked temporal constancy of behavior from fifty-two weeks to three years. Both the absolute time and the relative time for limb movement remain largely constant over a period of 2 years. For example, in the case of Twin *T*, the left foot always moves more quickly than the right, even though the time difference is small. Comparison of the tables also reveals many striking similarities in the timing of the behavior of the two infants. For example, the left foot of each child at fifty-six weeks takes 0.93 sec. to complete movement; at three years, 0.62 sec. At the age of three years the left feet, left hands, and right hands of the twins move at exactly the same speed for the two children.

For the individual children, the psychomotor constancy of speed of movement, over the 2-year period under consideration, is very marked. As the table indicates, the decrease in tempo for the whole four-limb stair-climbing pattern for Twin *T* was only 0.87 sec. in 2 years; for Twin *C*, only 1 sec. The decrease in tempo for the individual limb movements is considerably less than this and in one instance, that of Twin *T*'s left foot, the timing is exactly the same at fifty-six weeks and at three years.

Inasmuch as psychomotor constancy was demonstrated for the period from fifty-six weeks to three years, it is quite possible that similar constancies will assert themselves both with respect to similarities and differences throughout longer reaches of their developmental careers.

Comparative Studies of Other Types of Behavior

The results of the stair-climbing experiment were so decisive that they suggested the operation of principles which may well govern all forms of learning. At the very time of the stair-climbing study we made a similar exploration of the effects of specific training on the "cube behavior" of the twins. Later the twins, age nineteen months, were used for a highly controlled study of the effects of specific vocabulary training. At still later ages, three and one-half to four years, their play behavior was observed under training conditions which allowed comparative deductions. At the age of four and one-half years an extensive study was made of the effect of early and delayed practice on memory and motor performances. All these investigations used the same pair of twins and essentially the same methodological approach. The various studies could be used as checks against each other and in the aggregate they encompass a fairly comprehensive range of behaviors. The studies are here briefly described.

Cube Behavior Study.—The cube-play training, given to Twin *T* during an additional 10-min. period in conjunction with stair climbing, was directed toward stimulating the kind of play behaviors which are characteristic of normal children at the same stage of maturity as the twins, *viz.*, hitting the cubes together, giving the cubes to the experimenter, and building towers. The emphasis was placed upon tower building. Training was continued for 6 days a week during the 6-week period from ages forty-six to fifty-two weeks. Cinema records were taken of *T*'s and *C*'s cube behavior prior to and subsequent to training. Dictated protocols of training procedures and behavior responses were stenographically recorded during each training session and during the initial and final test behavior of both *T* and *C*.

Analysis of the daily records of *T*'s behavior showed evidence of growth over the previous day on 60 per cent of the training days (19). The evidence was conclusive that *T* showed rapid behavior changes during training, but *when her behavior was compared with* C'*s behavior growth during this same period,* T'*s performance was distinguished only by a slightly greater tendency to hand the cubes to the examiner.* Cinemanalysis of the twins' mechanics of cube prehension and manipulation (by Prof. H. M. Halverson) revealed no changes which could be attributed to training. Both before and after training *C* showed a tendency to regard the examiner as well as the cubes, while *T* confined her attention more completely to the cubes. The difference was considered to be a personality manifestation; the validity of this interpretation has been borne out by subsequent study (10). When Prof. Halverson was asked to identify the twin who had been trained, though hesitant to do so because of the similarity of the records, he decided upon the wrong twin!

Language and Growth.—The acquisition of language is a more highly socialized function than is the development of either stair-climbing ability or cube play. What is the role of maturation in this highly organized social behavior, so obviously dependent upon experience? Under our auspices, Strayer (18) investigated the problem by using the method of co-twin control. *T* and *C*, now about nineteen months old, again served as subjects. The experiment was conducted with rigid experimental control. The experimenter and nurse-assistant lived in isolation with the twins, who were temporarily separated from each other. *T* was given intensive vocabulary training for a period of 5 weeks beginning at her eighty-fourth week and continuing through her eighty-ninth week. During this time, *C* was isolated from *T* and all other persons except nurse and experimenter. They refrained from verbal expression in *C*'s presence but communicated with her by gestures; the experimenter used humming, wordless singing, and dramatic games in play. It was important for purposes of control that *C*'s joy in life not be curtailed by deprivation in verbal expression. Her keen delight in activities which were permitted and her general emotional tone suggested that such control was achieved.

At the close of Twin *T*'s training period, Twin *C*, age eighty-nine weeks, was trained for a period of 4 weeks. Twin *C*'s training was as nearly identical with that given to Twin *T* as it was possible to make it. The differential factor was the greater age of Twin *C* at the beginning of training. Although *C* did not learn in 4 weeks as many words as *T* learned in the 5 preceding weeks, she consistently led *T* when the comparison was made on the basis of days of training. In other words, *C* learned more rapidly than *T*, who was 5 weeks younger when she was trained. Detailed study of the data showed that *C*'s faster learning was not due to greater skill on the part of the experimenter in teaching vocabulary since, to an even relatively greater extent, *C* showed superiority to *T* at the younger age, in extending the application of the words specifically taught.

The environmental differences to which *T* and *C* were subjected during *T*'s training did produce different behavior patterns. *C* noticeably increased her use of gestures and developed an artificial laugh to attract attention. *C* also became highly mimetic and her vocalizations lacked the variety and expressiveness which *T* acquired. *C* reached a higher level of total language ability after 28 days than *T* attained after 35 days of training; but when they were ninety-three weeks of age, *T* was superior to *C* in specific language ability. *T* had continued learning after training ceased. Three months later, however, the differences were disappearing if not entirely gone. Again it was clearly demonstrated that learning, even in a highly socialized function such as speech, does not transcend even slight differences in maturity. The environment, important as it is, appears to be strictly limited in its effectiveness by maturational readiness.

Attentional Control in Play.—The method of co-twin control was also used to investigate the effect of training attentional characteristics shown in spontaneous play (20). Repeated observation of the play behavior of *T* and *C*, beginning in infancy, revealed striking similarity with some slight differences. When *T* and *C* were three and one-half years old, *T* was trained to channelize her activity by playing continuously with a toy of her choice. Training was given, generally twice a week, over a span of 4 months, with a total of 25 training periods. Each period lasted 45 min. *C* was observed during simultaneous periods in a room with toys which duplicated those used by *T*; but *C*'s play was entirely undirected. Test scores and play records made before and after training indicated that both twins showed modifications in behavior attributable to their experience. *T* had learned to play with the toys as she had been taught, and her area of attention showed restriction as well as prolongation of concentration. However, when the records were studied in detail, it was found that within the more restricted area certain of *T*'s characteristies of attention, relative to those of her co-twin, remained as before; restricted to fewer toys by training, she continued to shift her activity sooner, to engage more exclusively in just one activity, to change this activity more frequently, and to resort to greater physical activity, in spite of the fact that her training was designated to counteract this tendency. For instance, *T* spent 84 min. 35 sec. dropping marbles into a box while *C* spent only 27 min.; but *T* varied her method by hitting the marbles in, tipping the box so that they would roll in, bouncing them in, and using other diverse means of inserting them. The effects of the training did not manifest themselves when the twins played together; moreover, 9 months after the training ended a difference was no longer detectible even in solitary play. It was thus shown that, while training can be directed to change attentional characteristics in early childhood play behavior, the changes are not so fundamental as would at first appear to be the case.

Early and Delayed Practice in Motor and Memory Performances.—Another test of the role of learning and growth was made when the twins were four and one-half years old (Hilgard, 15). This time each twin served her turn as a trained and control subject. Twin *T* was trained 3 days a week for 8 weeks in tossing rings and walking on three boards graded in size. At the same time *C* was trained in digit and object memory and in paper cutting. After a 4-week rest interval the training was reversed: *T* was trained as *C* had been trained in digit and object memory and in cutting, while *C* was trained in tossing rings and walking on boards. Tests were made prior and subsequent to training. The results showed that delayed practice resulted in a greater gain in digit memory, object memory, ring tossing, and walking on boards 2 and 4 cm. in width. It resulted in similarity of scores on cutting corners and on walking on a board 6 cm. wide. Both these performances were near maximum efficiency, and there was therefore little or no chance for improvement. In straight cutting *C* developed an individual technique, so that *T*, whose training was delayed, never equaled the score of her earlier practiced twin. In this connection it is interesting to note that *C* had previously been more adept at learning to hold a crayon than *T*, who had equal opportunity to learn, and that in later years *C* showed greater interest and skill in sewing.

Three and 6 months after practice, the performances of the twins on all tests were as similar to each other as at the beginning of the experiment. The fact that the performances of both twins returned to the relatively same level of performance despite their different attainments with practice pointed to the importance of the general factor of maturity. It was further noted that substantial gains by the control twin without practice were accompanied by relatively stable and permanent gains by the practiced child, and vice versa—another testimony to the stability of maturation as opposed to more specifically directed learning.

These various studies have covered the period from infancy to adolescence and have resulted in comparable data, physical and behavioral, over a period of 14 years. Many of the observations were documented by cinema. The cinema records of the stair-climbing and cube behavior experiments have been edited to illustrate the original applications of the method of co-twin control. Other cinema records have been organized into two films each about 400 ft. in length in 16 mm. version, which deal in turn with the similarities and differences in behavior displayed at progressive age levels.*

Biogenetic Applications of the Method of Co-twin Control

The method of co-twin control was first used to show the interaction of maturation and training (*i.e.*, learning and growth) in specific experimental studies. A series of such studies, supplemented by naturalistic and clinical observations over a period of 14 years, have made it possible to adapt the method of co-twin control to a long range biogenetic analysis of life careers. By the age of fourteen Twins *T* and *C* have almost reached their psychological maturity. The student is referred to the monograph entitled *Twins T and C from Infancy to Adolescence* (10) for a glimpse into the long-range perspective of development.

When viewed in full perspective we find that the life careers of *T* and *C* have followed a significantly parallel course. Repeated experimental observations by the method of co-twin control have emphasized the stability and deep-seated nature of their underlying similarities. These same studies, however, have also served to expose certain relatively small but equally persistent differences. It is not the purpose of this chapter to discuss the origin and genesis of these differences. Suffice it to say here that they have had an indubitable influence upon the organization of the emotions and the patterning of personality attitudes and even of attentional habits in the field of adaptive behavior.

Over the long reach of 14 years, the behavior patterning of *T* and *C* has displayed a durable characteristicness, particularly with respect to what may be called "ontogenetic or maturational timing." Whether every physical and functional character of the organism carries in its structural basis its own timing mechanism is not known. Time genes have been posited as the determiners of time relationships during the period of embryogenesis.

Whatever the mechanism, these time regulators were to a remarkable degree alike in *T* and *C*. As embryos the twins were simultaneously derived from a single zygote, which divided with such extreme precision that the basic determiners of temporal schedule were apportioned so evenly in the form of gene effects that the twins have followed almost identical time tables, postnatally and doubtless also prenatally.

The acceleration of *T* has been so slight and so restricted as to have little perceptible effect. To be sure, her menarche came 6 weeks earlier. This is a palpable portion of time; but it is less than 0.8 per cent of all the weeks which transpired after conception. Mathematically speaking, this means a high degree of correspondence in two such highly intricate systems as the sexual cycle.

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* The films bear the following titles: Learning and growth in identical infant twins; Twins *T* and *C* from infancy to adolescence: A biogenetic study by the method of co-twin control—Similarities of behavior; Twins *T* and *C* from infancy to adolescence: A biogenetic study by the method of co-twin control—Dissimilarities of behavior.

The slight degree of precocity in postural behavior noted in infancy made *T* seem more active, more rangy, more sure on her feet; but this was only for brief periods. *C* was never really outdistanced because she was only a short lap behind and was being pushed forward by almost the same rate of maturing. In the field of fine motor coordination a difference was scarcely noticeable.

Maturation and Learning

The biogenetic study of Twins *T* and *C* reinforces the general conclusion that maturity factors are of primary importance in all learning and conditioning. The individual experimental studies by the method of co-twin control were addressed to this basic interdependence of maturation and learning.

The student must not expect an absolute cleavage between the areas of maturation and of learning. An eminent animal psychologist, C. Lloyd Morgan, who wrote an excellent book on *Habit and Instinct*, one time deplored that the habits were not colored robin's-egg blue and the instincts a bright pink! Our scientific task is to elucidate the dynamic relationships between the intrinsic and extrinsic factors of development, even though nature always presents us with a blend. We are dealing with the physiology of development. This physiology ultimately reduces to biochemical and bioelectric events which are as yet beyond the scope of observation; but these invisible events are faithfully reflected in the visible behavior patterns of Twins *T* and *C*.

Let us now consider the mechanism by means of which the behavioral organism achieves its *species* characteristics and yet at the same time makes individual adaptations within its environmental field. This is the problem of learning and growth.

From the moment of fertilization, intrinsic and extrinsic factors cooperate in a unitary manner; but the original impulse of growth and the matrix of morphogenesis are endogenous rather than exogenous. The so-called "environment," whether internal or external, does not generate the progressions of development. Environmental factors support, inflect, and specify; but they do not engender the basic forms and sequences of ontogenesis.

Even before the human embryo has a nervous system it is a perfectly integrated organism. It changes in shape and dimensions with each passing hour. It grows. This process of growth, which derives its fundamental impulsions and directions from the zygote, produces continuous reconfiguration. It configures the embryonic vesicle; the blastodermic layers; the skeleton, the skull, the profile of fetal, infantile, and adult nose; and the primary organization of the neuromotor system.

The function of the nervous system is to maintain the integrity of the organism and to anticipate the specific demands of the environment with provisional and preparatory arrangements. These fore-reference arrangements are not determined by stimulation from the outside world. Experience does not create them. Coghill (4) has shown that the primary neural mechanism of walking (in the Amblystoma) is laid down before the animal can at all respond to its environment. The primary attitude of the organism and the initiative of attitude are thus intrinsically determined. We apply the term "maturation" to this intrinsic and prospective aspect of ontogenetic patterning. It has been abundantly illustrated in the sequential series of motor attitudes which characterize the development of prone and upright postures.

The sequential patterning expresses itself in progressive differentiations within a total action system. The basic order and the general modality if not the specific outline of these differentiations are determined by intrinsic factors. The intrinsic nature of this determination is most strikingly demonstrated in the marked degree of behavior correspondence found in highly identical twins. Our studies of Twins *T* and *C* have shown that the resemblances in the behavior patterns of these twins were astonishingly numerous. When 13 developmental examinations were analyzed and inventoried for discrete behavior items, 612 separate comparative ratings of such items being made, it was found that there were 99 items of minor disparity and 513 items of identical or virtually identical correspondence.

In the field of pellet prehension, this parity was very neatly disclosed. A small pellet, 8 mm. in diameter, was placed on a table top before each child, within easy reach. At twenty-eight weeks both of the twins were visually unheedful of the pellet, though they definitely regarded a cube. At thirty-eight weeks they addressed themselves in an identical manner to the pellet (Fig. 5). The hands were placed in full pronation, the fingers were fully extended and spread apart in a fanlike manner. The thumb was extended almost at right angles. The photographic record of their attack upon the pellet in the motion pictures shows an almost uncanny degree of identity in the details of postural attitude, hand attitude, approach, and mechanism of grasp. At forty weeks there was a crude raking attack upon the pellet; at forty-two weeks this raking approach was replaced by a poking with the tip of the index finger. These changes in prehensory pattern occurred contemporaneously in both children. Such changes may be regarded as manifestations of the individuating aspect of maturation.

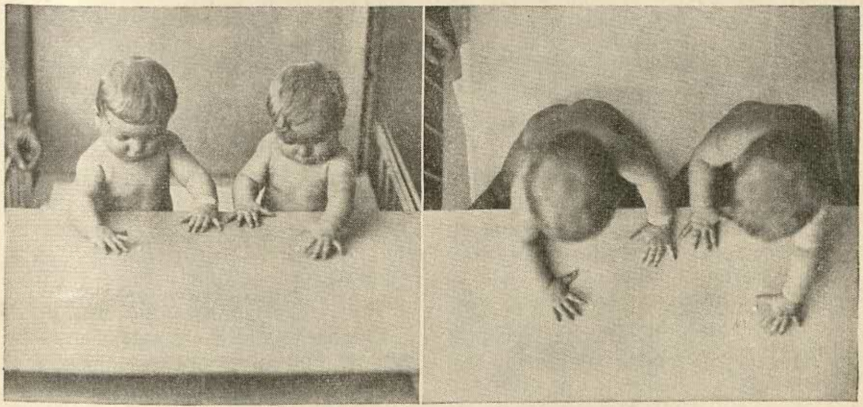

FIG. 5.—Simultaneous instantaneous horizon and zenith views of twins *T* and *C* at 38 weeks of age, showing similarity of behavior pattern in prehensory approach upon a pellet.

The intimacy of the relationships between maturation and learning were neatly revealed in the pellet-and-bottle situation which was presented to the twins at the age of forty-eight weeks. The twins were in the same crib, seated back to back, and confronting each her own examining table. Two examiners simultaneously held a small 4-oz. glass bottle in view and dropped an 8-mm. pellet into the bottle. Three trials were made with each child. The examiner, having dropped the pellet into the bottle, gave the bottle to the child.

Both children watched this dropping of the pellet with the same transfixed attention. Both children on the first trial, and again on the second trial, seized the bottle, apparently heedless of the contained pellet; but both children on the third trial (without, of course, any influence of imitation) pursued the pellet by poking at it against the glass, showing an identical capacity to profit by experience.

In this instance we find that the correspondence of behavior patternings extends into the minute fields of specific adaptation or of learning. It may be readily granted that maturational factors primarily account for the similarity in capacity and general maturity displayed by these twins. Perhaps these same maturational factors also account for the more detailed correspondences, such as the mode of visual attention, the primary preoccupation with the bottle, and the secondary interest in the pellet. Within a brief span of time we see the spontaneous behavior patterns undergo a specific adaptation and we ordinarily call this "adaptation" learning. But the distinctive criteria of maturation and learning are not easily applied.

Let us assume that on the morrow, in the pellet-and-bottle situation, both children poke immediately with extended forefinger against the side of the bottle. Is this fixation of behavior due to the experience of the previous day? And shall the assimilative processes of the intervening night be regarded as maturation because the modification did not occur in immediate response to the situation; or shall it be called learning because it is virtually a specific adaptation to stimuli recently in the external environment? The fixation of the poking pattern, however, proves to be temporary, because in another lunar month, without specific experience, these same twins adaptively tilt both bottle and hand and thrust the extended index finger into the open mouth of the bottle in pursuit of the pellet. Is this incremental differentiation of behavior pattern to be attributed to maturation or to learning?

The concept of maturation emphasizes the unity of the organism and the priority of the total pattern of response. The unity of the organism is not to be regarded as a mystical abstraction, but as a reality, *viz.*, the functional unity of the total reaction system. Herrick (14) identifies it particularly with the diffuse nervous network of "neuropil which pervades the brain substance and binds it all together as a functional unit. Into this neuropil there is a continuous discharge from every sensory surface of the body, fluctuating from moment to moment but always acting. Here growth is going on as long as learning is possible, here the total pattern expands, and here partial patterns are individuated." Here also is the anatomic basis for conditioning of the Pavlovian type.

The basic ontogenetic forms of individuation are the result of maturation. Conditioning is superimposed, as it were, upon a maturational substrate. "Conditioning of reaction" as conceived by Coghill "is accompanied by restriction [narrowing] of the zone of adequate stimulation and concomitant restriction in the field of action. The primacy of structural basis for this is in the mechanism of the total pattern." This pattern, be it remembered, "is a growing thing."

For this reason all learning involves growth. "It involves a change, more or less stable, in the anatomical structure of the body, and the neuropil as the most labile part of the nervous system plays the most significant part in this reorganization of the mechanisms of behavior" (14).

The individual comes into his racial (and familial) inheritance through the process of *maturation*. He comes into his social inheritance through processes of *acculturation*. These two processes operate and interact in close conjunction. Only through systematic studies of child development, naturalistic, biometric, and experimental, can we gain an insight into the relationship of maturation and acculturation. Here indeed is one of the most comprehensive and crucial problems of the life sciences. In this problem genetic psychology and cultural anthropology have a common stake.

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CHAPTER XIV

THE EFFECTS OF PRESCHOOL ATTENDANCE UPON INTELLECTUAL DEVELOPMENT

Beth L. Wellman

From the moment of birth on, the child is subjected to a variety of environmental influences and experiences. Do these experiences affect the course of his intellectual development? If so, which of the experiences have the greatest effect, and what is the nature of the effects? At what ages are the experiences most important? It is with problems such as these that this chapter is concerned. The chapter, however, deals only with a segment of the total problem, that of the effects of certain kinds of educational experiences upon intellectual development. More specifically, it deals with the effects of preschool attendance.

The educational experiences of the child during his hours in school are, of course, only a part of his total educational experiences.* But it is feasible to study the effects, if any, of his school experiences upon his intellectual development. It should be obvious that if a good environment can accelerate growth, a poor environment may retard or depress growth.† The material presented in this chapter is limited to a discussion of certain educational experiences that have been found to accelerate intellectual development. It includes only a part of the ensemble of Iowa studies on environmental influence on intelligence.‡

Program of Testing

From the opening of the preschool laboratories of the Iowa Child Welfare Research Station in 1921, it has been the custom to obtain two intelligence tests per year on each child enrolled. Usually one test has been obtained in the fall and another in the spring. This policy was followed less rigorously in the first years of the preschool than in later years. However, even in the first years, a high proportion of the children enrolled were so tested. The material presented in the following sections includes the children enrolled from September, 1921, to June, 1938.

The children who attend the preschool laboratories come preponderately from the higher occupational levels; about two-thirds of them are from the professional classes and none from the lowest occupational groups. In recent years there have been about 90 children enrolled each year, attending for half-day sessions and divided into age groups of two-year-olds (children between the second and third birthdays at the beginning of the academic year), three-year-olds, four-year-olds, and five-year-olds. In the earlier history of the preschools, the registration was somewhat smaller.

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* For a discussion of the meaning of environment in intellectual development, see Wellman (14).

† A study that reported losses in I.Q. produced by an unfavorable orphanage environment at the preschool ages is that by Skeels *et al.* (5). At the later childhood ages, the studies of children in isolated mountain regions uniformly report lower I.Q.'s for the older children than for the younger children in such communities. See review of the literature by Stoddard and Wellman (9).

‡ For a summary of Iowa studies on the effects of schooling on older children, see Wellman (15). For a résumé of studies on foster children and institutionalized children, see Skeels (4).

Examinations were made either on the 1916 Stanford revision of the Binet scale or the 1922 Kuhlmann revision of the Binet scale. The general policy in most years was for children under three and one-half years of age to receive the Kuhlmann revision and for the older children to receive the Stanford revision. There were some minor variations from this general policy. The examiners were staff members and research assistants, all of whom were experienced. Their basic training had been received at a number of different colleges. The usual schedule was for an examiner to be assigned to a preschool group, and more often than not there was a change of examiners in a group from fall to spring. No attempt was made to inform the examiner of the previous I.Q. of the child.

The fall testing schedule usually extended over a period of several weeks beginning about 2 weeks after the opening of preschool; a few groups were, however, tested prior to the opening of school. To be included in the following sections of this chapter, a "fall test" must have been taken between August 1 and December 31, and a "spring test" must have been taken between March 1 and June 30.

Changes in I.Q. Made by Children When Attending Preschool

There were 652 children enrolled between September, 1921, and June, 1938, for whom tests were available at the desired dates covering one year of preschool attendance. For the majority of children the period covered was their first year of enrollment in preschool; for the remaining children there was substituted the first year for which complete test data were available. The mean I.Q. of the 652 children in the fall was 116.9, or above average. Their mean age at the fall test was 48.0 months and at the spring test 54.0 months. In the spring these children were on the average 6.6 points higher in I.Q. than they had been in the fall. Seventy-one per cent of the group had gained one or more points; 36 per cent had gained 10 or more points, while only 6 per cent had lost 10 or more points.

FALL TO SPRING CHANGES
$N = 652$

Fall I.Q.	116.9
Fall C.A., months	48.0
Spring C.A., months	54.0
Mean change in I.Q. from fall to spring	+6.6
Standard deviation of change in I.Q.	11.5
Per cent gaining one or more points in I.Q.	71
Per cent gaining 10 or more points in I.Q.	36
Per cent losing 10 or more points in I.Q.	6

Gains in I.Q. were made at all ages from two years to six years, inclusive, as will be seen from the tabulation at top of page 231. In general, there was a tendency for the younger children of the group to gain more than the older children. In this and the following comparisons, the age group of two years includes children from eighteen to twenty-nine months; three years, thirty to forty-one months, etc.

About half of the group were boys and half girls. There was a general tendency for the girls to receive higher I.Q.'s than the boys. The reason for this difference is not clear from our data. It might be the result of some unknown selective factor in our group; it is possible that girls at these ages are generally brighter than boys, or that the tests at these ages are so constructed as to favor girls. The mean changes in I.Q. made by the boys and girls in our group were very similar; the

Age, months	Number	Fall I.Q.	Change in I.Q. from fall to spring	Per cent gaining one or more points	Per cent gaining 10 or more points	Per cent losing 10 or more points
18 to 29	61	118.3	+6.7	62	46	11
30 to 41	175	117.4	+9.0	76	43	7
42 to 53	172	116.2	+6.7	76	40	8
54 to 65	188	118.2	+4.7	65	27	3
66 to 77	56	111.7	+3.9	70	22	5

339 boys gained +6.8 I.Q. points and the 313 girls +6.1 points. In the following tabulation results are given for the total group and for the separate age groups in which the number of cases was 40 or more.

Age, months	Boys			Girls		
	Number	Fall I.Q.	Mean change in I.Q.	Number	Fall I.Q.	Mean change in I.Q.
30 to 41	95	117.1	+8.9	80	117.9	+9.0
42 to 53	78	112.4	+7.9	94	119.3	+5.8
54 to 65	95	116.8	+4.8	92	119.7	+4.6
18 to 77	339	114.9	+6.8	313	119.1	+6.1

As was stated earlier, some of the children were tested on the Kuhlmann revision of the Binet scale and others on the 1916 Stanford revision of the Binet scale. One hundred twenty-four children were given the Kuhlmann revision both fall and spring, 450 were given the Stanford revision both times, and 78 received the Kuhlmann revision in the fall and the Stanford revision in spring. Gains from fall to spring were made by each of these groups, the gains being respectively +8.3, +6.0, and +6.8 points. Children who changed from the Kuhlmann to the Stanford revision made gains, as did also those who were retested on the same revision. The tabulation at top of page 232 gives the changes for the separate age groups where the number of cases was 40 or more. In the Stanford-Stanford group, there was a tendency for the gain to be greater for the younger children than for the older children.

The average interval between fall and spring tests was six months. However, since the testing periods both in the fall and in the spring extended over several weeks, the interval varied for different children. There were 182 children for whom the interval was 2 to 5 months (46 to 165 days), 260 for whom the interval was 6 months (166 to 195 days), and 208 children for whom the interval was 7 or 8 months (196 to 255 days). Only 14 children had less than 4 months between tests. The children with the longest fall-spring interval between tests made a gain of 8.3 points, and the other two groups made gains of 5.5 and 5.7 points, respectively. In the following tabulation are given the changes for the separate age groups where the number of cases was 40 or more. There is no consistent trend in the age groups for the gain to

Age, months	Kuhlmann-Kuhlmann			Kuhlmann-Stanford			Stanford-Stanford		
	Number	Fall I.Q.	Mean change in I.Q.	Number	Fall I.Q.	Mean change in I.Q.	Number	Fall I.Q.	Mean change in I.Q.
18 to 29	50	119.3	+5.2						
30 to 41	74	118.4	+10.3	55	120.2	+7.0	46	112.7	+9.0
42 to 53	...	.....	....	..	.....	.....	162	117.0	+6.6
54 to 65	...	.....	....	..	.....	.....	181	118.5	+4.6
66 to 77	...	.....	....	..	.....	.....	54	111.4	+4.3
18 to 77	124	118.7	+8.3	78	116.9	+6.8	450	116.4	+6.0

increase with increasing interval; however, at no age does the group having the shortest fall-spring interval show the greatest gain.

Age, months	Interval								
	2 to 5 months			6 months			7 to 8 months		
	Number	Fall I.Q.	Mean change in I.Q.	Number	Fall I.Q.	Mean change in I.Q.	Number	Fall I.Q.	Mean change in I.Q.
30 to 41	50	120.8	+5.8	62	119.1	+10.3	62	113.5	+10.0
42 to 53	49	117.6	+5.3	62	116.5	+ 5.8	61	114.7	+ 8.8
54 to 65	53	120.9	+4.6	83	119.1	+ 3.2	51	114.1	+ 7.3
18 to 77	182	119.0	+5.5	260	117.7	+ 5.7	208	114.2	+ 8.3

The changes for each interval grouping of one month where the number of cases was 40 or more were as follows:

Interval, months	Number	Fall I.Q.	Mean change in I.Q.
5	132	121.5	+4.4
6	260	117.7	+5.7
7	134	113.3	+8.8
8	74	116.0	+7.2

With one exception, each addition of a month in the interval between fall and spring tests increased slightly the mean gain in I.Q.

For the most part, the children attended preschool for half-day sessions, usually in the morning. However, for a few calendar years one group of the several preschool groups in session simultaneously attended from 9 A.M. until 4 P.M. It was thus possible to compare the changes made by children attending all day with those made by children attending half days. Such a comparison was presented in an article published in 1932 (11). In order to make the comparison as fair as possible and to rule out the possible effects of age differences and differences in initial I.Q., the all-day children were matched with half-day children on age and I.Q. on the fall test. The two members of each pair were the same year of age and within the same classification in I.Q. (average, superior, etc.). This procedure yielded 47 pairs, with mean fall I.Q.'s of 118.6 and 119.4, respectively. The all-day children gained +10.5 points in I.Q. from fall to spring and the half-day children gained +4.7 points.

Group	Number	Fall I.Q.	Mean change in I.Q.
All-day......	47	118.6	+10.5
Half-day.....	47	119.4	+ 4.7

The same trend of greater gains for the all-day children was found for 33 pairs matched on interval (same month) age and I.Q.

Changes in I.Q. by Preschool Children during Vacation

The changes made from fall to spring can be best evaluated by comparing them with changes made by children of the same ages and same levels of ability when not attending preschool. One way to make such a comparison is to show the changes made by the same children during the summer vacation period. Another way is to compare different groups of children—a group attending preschool with a control group of nonpreschool children. Both types of comparison have been made in the Iowa studies. In this section are presented the changes made by preschool children during the summer vacation.

For 317 children, tests were available in the spring and the following fall. The mean chronological age at the time of the spring test was 45.8 months and the mean I.Q. was 124.2. The mean change in I.Q. from spring to fall 6 months later was −1.1 points. For 70 of these children, a second spring-fall comparison was available, for 21 children two additional comparisons, and for one child three additional comparisons, making a total of 115 subsequent spring-fall comparisons. The mean spring I.Q. for the 115 cases was 126.2, the mean change in I.Q., −2.3 points.

FIRST SPRING-TO-FALL CHANGES
$N = 317$

Spring I.Q....................	124.2
Spring, C.A., months............	45.8
Fall C.A., months..............	51.8
Mean change in I.Q. from spring to fall......................	−1.1
Per cent gaining one or more points in I.Q.................	43
Per cent gaining 10 or more points in I.Q......................	18
Per cent losing 10 or more points in I.Q......................	26

In comparison with the fall-to-spring changes, it will be seen that the ages and intervals between tests were quite comparable and that, whereas the children made considerable gain from fall to spring, no particular mean change was evident from spring to fall. Whereas 71 per cent gained from fall to spring, only 43 per cent gained from spring to fall; twice as many gained 10 or more points in I.Q. from fall to spring (36 per cent) as from spring to fall (18 per cent).

In the following tabulation are given the mean changes and per cent of

Age, months	Number	Spring I.Q.	Change in I.Q. from spring to fall	Per cent gaining one or more points	Per cent gaining 10 or more points	Per cent losing 10 or more points
30 to 41	87	125.7	−1.7	40	20	34
42 to 53	111	124.7	−1.3	43	19	24
54 to 65	95	122.4	−1.2	44	13	20

children gaining from spring to fall for the separate age groups where the number of cases was 40 or more. The age groups are in close agreement in showing no substantial mean change over the summer or in the percentage of children gaining one or more points.

There were 166 boys in the spring-fall group. They changed only +0.4 points, as compared with a gain of +6.8 points for the boys in the fall-spring group; the 151 girls in the spring-fall group lost 2.7 points, as compared with a gain of 6.1 points for the girls in the fall-spring group. The changes by sex for the separate age groups were similar to those for the total group.

Age, months	Boys			Girls		
	Number	Spring I.Q.	Mean change in I.Q.	Number	Spring I.Q.	Mean change in I.Q.
30 to 41	45	125.6	−0.8	42	125.7	−2.6
42 to 53	56	121.2	+0.7	55	128.2	−3.2
54 to 65	51	120.0	+0.5	44	125.3	−3.3
18 to 77	166	121.9	+0.4	151	126.7	−2.7

The average interval between spring and fall tests was 6 months. There were 93 children with intervals of 3 to 5 months (76 to 165 days), 126 with an interval of 6 months (166 to 195 days), and 98 with intervals of 7 to 9 months (196 to 285 days). There was little mean change at any of these intervals. The changes were, respectively, +0.4, −1.5, and −2.1 points.

Interval, months	Number	Spring I.Q.	Mean change in I.Q.
3 to 5	93	124.0	+0.4
6	126	122.4	−1.5
7 to 9	98	126.9	−2.1

For the interval groupings of one month, where the number of children was 40 or more, the changes were as follows:

Interval, months	Number	Spring I.Q.	Mean change in I.Q.
5	78	124.9	+0.5
6	126	122.4	−1.5
7	77	129.8	−2.8

There is no tendency here for gains similar to those made over the same length of time from fall to spring.

Changes during Consecutive Years in Preschool

There were 228 children (15, page 383) for whom test records were available each fall and spring over 2 years of preschool attendance, and 67 children for whom tests were available each fall and spring over 3 years of preschool attendance. For the majority of the children, these represented successive calendar years; however, for 27 of the 228 children and for 12 of the 67 children, one or more calendar years intervened between a spring and fall test. In order to make the comparison one in which every child was tested each fall and spring without break in the sequence, the exceptional children have been omitted, leaving 201 children receiving the following successive tests approximately 6 months apart: fall-spring-fall-spring; and 55 children receiving the following successive tests: fall-spring-fall-spring-fall-spring.

Time of test	Two years' attendance $N = 201$		Three years' attendance $N = 55$	
	Mean age, months	Mean I.Q.	Mean age, months	Mean I.Q.
Fall 1	41.0	117.1	32.6	117.1
Spring 1	47.0	124.5	38.6	125.1
Fall 2	53.1	124.3	45.0	123.7
Spring 2	59.0	127.6	50.8	127.3
Fall 3	....	.....	56.7	125.5
Spring 3	....	.....	62.7	127.0

The changes in I.Q. by the above groups are represented in the following diagram:

Group	F^1 to S^1	S^1 to F^2	F^2 to S^2	S^2 to F^3	F^3 to S^3	Net change in I.Q.	Total interval, months
Two-year group	+7.4	−0.2	+3.3	.....	.....	+10.5	18.0
Three-year group	+8.0	−1.4	+3.6	−1.8	+1.5	+ 9.9	30.1

Without exception, changes from fall to spring were positive and changes from spring to fall were negative, although the latter were negligible in amount. The gain became less with successive years in preschool.

The mean change in I.Q. from the first fall to the second spring (18 months' interval) was +10.5 points, a substantial gain. The mean change from the first fall to the third spring (30 months' interval) was +9.9 points. The gain over 2 years of preschool attendance was as great as that over 3 years; the change made over the third year merely served to maintain the previous gains.

Changes Made by Nonpreschool Children

Another way to evaluate the changes made by preschool children is to compare them with changes made by other children of the same ages and levels of ability and drawn from the same community who have not attended preschool. The results for such a control group were reported in an article published in 1934 (12). Sixty-eight nonpreschool children from Iowa City were studied. During infancy these children had received frequent mental and physical examinations but had not received the Binet test. In order to obtain tests at the preschool ages, the parents were asked to bring the children for additional measurements. If the child was two years to three and one-half years of age, he was given the Kuhlmann revision of the Binet scale; if older, he received the 1916 Stanford revision of the Binet scale.

The 68 children were retested after an average interval of 8.2 months. The range of initial I.Q.'s was from 52 to 163, with only one case falling below 84. The mean initial I.Q. was 118.0, and the mean change in I.Q. was a loss of 1.8 points.

	Test	Re-test	Difference in means
Mean I.Q.	118.0	116.2	−1.8
Mean age, months	37.1	45.3	8.2
Number of children	68	68	

For 34 of these children a test was given in the fall and a retest the following spring. The change in I.Q. from fall to spring was a loss of 3.9 points.

	Fall test	Spring test	Difference in means
Mean I.Q.	120.0	116.1	−3.9
Mean age, months	40.6	45.7	5.1
Number of children	34	34	

The nonpreschool children were quite comparable in general level of ability to the preschool children described in the previous sections. The changes in I.Q. by the nonpreschool children were similar to those made by preschool children during periods of nonattendance. There was no tendency for them to make the gains from fall to spring that were characteristic of the preschool children.*

Interpretation of Findings at the Preschool Ages

Do these changes in test I.Q. represent real changes in intellectual ability? If so, are the gains the direct result of preschool attendance? In order to answer these questions, it is necessary to check on alternative explanations and other conditions that might account for the differences.

Are they due to practice effects?—Are the gains made by preschool children simply the result of practice effects? "Practice effects" means that some benefit accrues to an individual from having had a previous experience in taking a test, so that he is enabled to do better on a subsequent testing. In the strictest sense, practice effects stem from memory of the previous experience. However, another mechanism frequently cited as contributory to practice effects is that of an improvement in responsiveness or increase in "outgiving" tendencies resulting from greater familiarity with the testers or the testing situations. It is thought that the young child may "hold back" when in unfamiliar circumstances. Are such practice effects prevalent in the preschool data?

It should be kept in mind that the tests of the preschool children were 6 months apart. Therefore, in order to do relatively as well (receive the same I.Q.) a child must pass more test items on his retest than on the initial test. If there are practice effects, then, they must be added to the increase in ability (M.A.) that takes place as the child grows older.

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* A more recent study, done by Messenger (3) under the direction of Dr. Ruth Updegraff, has shown similar results. As one part of a comparative study of the development of nursery-school and nonnursery-school children, Messenger compared the change in I.Q. over a 2-year period of a group of 20 preschool laboratory children with that of 22 nonnursery-school Iowa City children, similar to the preschool children in socioeconomic status of parents, initial I.Q., and age. The nonpreschool children did not gain in I.Q. The difference between nursery-school and nonnursery-school children in I.Q. at the end of the 2 years was statistically significant. A group of nonnursery-school children in Oklahoma also failed to show a gain in I.Q. over a 2-year period, although nursery-school children in the same locality gained.

If there are memory practice effects that carry over a 6 months' period, such effects should be characteristic of different groups of children of similar ages and similar levels of ability. The spring-fall data show no indication of practice effects over that 6 months' period (change of −1.1 points for 317 children). The ages of the children were similar to the ages of the fall-spring group, and the interval was similar. Furthermore, the same children retested at several consecutive 6 months' intervals showed gains only in the fall-spring periods and never in the spring-fall periods. Also, the control groups of nonpreschool children showed no tendency to gain.

The data on the I.Q. changes for different interval groupings within the fall-spring and spring-fall groups are pertinent to the problem of practice effects. If memory practice effects are operating, it seems likely that they will be more evident over shorter intervals between tests than over longer intervals. The results from the analyses on interval groupings give no support to this expectancy. The trend in the fall-spring groups was in the reverse direction, the greatest gain being made over the longest interval.

In this connection, too, it is well to bear in mind that substantial losses are sometimes obtained for groups at the preschool ages.* Losses cannot be attributed to practice effects.

Because of the arrangement of the preschool testing program and the usual change in examiners at each testing, it is doubtful that increased acquaintance with any given examiner plays a role in the increases in I.Q. However, the children are likely to be better acquainted with the examiners in general in the spring than in the fall. Degree of acquaintance, then, could be a factor operating to produce differential changes. The fall testing is not usually begun until after school has been in session for at least 2 weeks; it continues for a period of about 6 weeks. The examiners are instructed to spend a brief period of preliminary observation in the preschool group to be tested and to begin with subjects formerly enrolled in preschool. To some extent these precautions take care of the matter of acquaintance, but they do not ensure complete comparability between the fall and spring periods.

Experience with testing situations as such appears not to be an explanation of the differences in gains, since gains do not occur from spring to fall. The children are more experienced with testing situations in the fall than they were in the preceding spring, but they do not increase in I.Q. over this period.

If changes in general negativistic tendencies are responsible for the I.Q. changes, then preschool children decrease in negativism when in preschool, but do not continue to improve when at home in the summer. The preschool may then be considered as causing an improvement in negativistic behavior, which in turn causes an improvement in intellectual functioning. If this improvement in intellectual functioning is widespread and not limited to the specific test items, then we may say that intelligence has been improved. This type of improvement in behavior is not properly classified as practice effects.

Are the changes due to the bias of the testers?—To what extent does the knowledge by examiners that preschool children usually increase in I.Q. affect the test results? In regard to the Iowa preschool data, it may be said that the preschools had been in session for a number of years before anyone was aware of the differences in fall-spring and spring-fall changes. Yet increases in I.Q. from fall to spring were as characteristic of the earlier years as of the later years. The preschools were opened in the fall of 1921. The first analysis of fall-spring *vs.* spring-fall changes was made in 1931 and published in two articles in 1932 (10, 11). Since prior to 1931 the examiners were unaware of the trends in change, it may be of some interest to compare the changes made prior to that date with the changes made by subsequent groups. The changes from fall to spring for the 652 children thus subdivided are given in the following tabulation. Changes are also given for each age group where the number of cases was 40 or more.

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*Losses were reported in a group of orphanage nonpreschool children by Skeels, Updegraff, Wellman, and Williams (5) and by Wellman, Skeels, and Skodak (16).

Age, months	Before fall, 1931			Fall, 1931 and later		
	Number	Fall I.Q.	Mean change in I.Q.	Number	Fall I.Q.	Mean change in I.Q.
30 to 41	86	115.1	+9.8	89	119.7	+8.2
42 to 53	102	113.1	+9.0	70	120.7	+3.3
54 to 65	92	115.0	+6.9	96	121.3	+2.6
18 to 77	332	114.3	+8.2	320	119.7	+4.7

The gain from fall to spring was greater in the years before the results were first analyzed than afterward. This is true at each age level as well as for the total group. If knowledge of expected results was a factor here, it operated in the direction of reducing the gains. It will be noted that the mean fall I.Q. was higher for the groups entering in the later years than the earlier years.

Although the test records are on file in the central office (in a different building from the preschools), it has not been customary for the examiners to look up previous test results; more often than not a given child's previous I.Q. is not known by the examiner.

Bias of the examiners may operate in the direction of leniency in scoring. If so, to account for the preschool increases, the spring examiner must be more lenient than the fall examiner (the spring I.Q.'s are higher) and the fall examiner must be less lenient with new children than with children formerly enrolled (the I.Q.'s of new children are lower), while at the same time showing the same degree of leniency with the former enrollees that the spring examiner had shown (I.Q.'s the same). It is obvious that no one policy of leniency will cover the different conditions of change.

Are the changes due to coaching?—Coaching refers to direct teaching of the test items. It is possible, of course, for a zealous parent, anxious for his (or her) child to make a good showing, to teach the correct answers. We have no knowledge that this has taken place in any instance. It is highly improbable that it has occurred in any substantial number of cases. There is no reason why it should not occur before the fall test as frequently as before the spring test.

Teaching of the test items has not been practiced by the preschool teachers; many of the teachers do not know the content of the tests. If they have taught material similar to the test content, it has been done because they thought it desirable for the child to know that subject matter. Such teaching should not be classified as coaching but rather as a part of the child's general experience in living.

Are the changes due to season?—Since the gains of the preschool children take place over the winter months and not over the summer months, are they due to season of the year rather than to preschool experiences? The group of nonpreschool children tested in the fall and retested in the spring did not gain in I.Q. (mean change, −3.9 points). For them there was no seasonal acceleration.

Are the changes due to sex differences?—There was about an equal number of boys and girls in the fall-spring and spring-fall groups.

Are the changes due to inadequate standardization of the tests?—The claim is sometimes made that the test constructors put on the market tests that were inadequately standardized at the preschool ages. It is stated that the groups of children used in the standardization process at the preschool ages were not so representative of the average population as the standardization groups at the older ages. Hence when the test is applied to new groups of young children, it tends to yield distorted I.Q.'s.

If this claim is correct, there should be a systematic change in I.Q. in the same direction for all groups tested within the age range to which the criticism applies and retested at an age beyond which the criticism applies. If the test systematically yields too high an I.Q. at the younger ages, there should be a loss in I.Q. on the retest at the older ages; if it systematically yields too low an I.Q., there should be a gain in I.Q. on retest. If test and retest both lie within the age ranges to which the criticism applies, systematic changes would be such as represent whatever differences there are between the standardization groups at the two points in age in question.

As this concept is applied to the data in the foregoing section, it is apparent that, when attendance is not taken into account, no systematic tendency for gain or loss holds for all groups of children tested at one age and retested at comparable intervals. Gains occur from fall to spring for all age groups of preschool children from two to six years and fail to occur from spring to fall for all age groups. These changes are not what would be expected from inadequate standardization.

Are the changes a function of the form of test used?—Is it possible that the changes are relevant only to the form of tests used or to the fact that both Kuhlmann and Stanford revisions were used? It will be recalled that gains were made from fall to spring whether the Kuhlmann revision was used at both sittings, the Stanford revision at both sittings, or the Kuhlmann at one sitting and the Stanford at the other. The respective gains were +8.3, +6.0, and +6.8 points.

Additional studies utilizing the Merrill-Palmer scale of performance tests (13) and Form *L* of the 1937 Stanford revision of the Binet scale (2) have yielded similar results. Henry (2) studied the fall-spring changes on Form *L* for 177 children enrolled in the preschool laboratories during the years 1938–1939 and 1939–1940. The mean fall I.Q. was 126.2 and the spring mean was 130.5, a gain of +4.3 points. Henry also studied the spring-fall changes on Form *L* for 49 children, whose mean change in I.Q. was −1.4 points.

Thus greater gains from fall to spring than from spring to fall for the preschool children occurred on all the forms and all combinations of the forms. The nonpreschool children were tested on the same forms as the preschool children but did not show gains.

Are the changes due to selective factors?—Is it possible that only the children who gain are retested and that if all children were included the results would differ? The general policy of testing was to give two tests to every child enrolled in preschool during the academic year. During the years up to June, 1938, there were 935 individuals enrolled in academic years. Of these, 127 did not attend a complete year; some of them withdrew before the end of the year and others entered preschool the second semester and were thus not available for the initial fall test. Of the remaining 808 children, 652 were included in the fall-spring changes reported in the preceding section. This left 156 children who, although enrolled for a complete year, did not receive fall and spring tests at the desired dates. Some of these are accounted for by the policy of testing in the earlier history of the preschools, when the efforts to obtain two tests during a year were not so rigorous. Others are accounted for by absences at one of the testing periods, and a few (12) because the examiner was unable to secure adequate rapport. It does not seem likely that the children who were regularly enrolled but were exceptions to receiving tests at the desired dates made changes radically different from those made by the 652 children.

The spring-fall group of 317 children of necessity included only children who were enrolled in two consecutive academic years. The changes in I.Q. reported for the 201 children who received tests each fall and spring for 2 years gave no indication of variation from the pattern for the larger groups (652 children for fall-spring changes and 317 children for spring-fall); the children who attended 2 years showed the same pattern of I.Q. change over the first year as the total group. The changes over 1 year were, respectively, +7.4 and +6.6 points. Neither was there any apparent selection as regards I.Q. level, those who attended 2 years having an initial I.Q. approximately the same as the 1-year group. The initial I.Q.'s were, respectively, 117.1 and 116.9.

Does the fact that the children represent an upward selection of the population account for the changes? The children who attend the preschool laboratories come mostly from the upper socioeconomic levels and are above average in intelligence. The mean initial I.Q. for the 652 children lies within the superior classification. The socioeconomic level remained constant for the group that attended preschool 2 years, yet their I.Q.'s fluctuated with periods of preschool attendance. The respective gains for the 201 children were: +7.4, −0.2 and +3.3.

If factors connected with high socioeconomic status rather than with preschool attendance were causative of the fluctuations, such factors would need to vary with the seasons. It was shown that a group of nonpreschool children who were also from the higher socioeconomic levels did not gain in I.Q. from fall to spring. The mean change was a loss of 3.9 points. In this group of nonpreschool children there was no evidence of seasonal fluctuations in the direction of a gain over the winter months.

Were there selective factors in regard to the group of tested nonpreschool children that render them not typical of nonpreschool children of superior ability? The nonpreschool group was small in comparison with the number of preschool children. A comparable number of children selected at random from the preschool group would, however, show gain from fall to spring. The nonpreschool group was composed of children from the same locality (Iowa City) as the preschool children. They had been brought by their parents for repeated mental and physical examinations during infancy, but they had not received the Binet test prior to the results reported in the previous section. The nonpreschool children were known not to have attended play groups or private preschools, since there were none available in the community. A sampling of nonpreschool children taken several years later in the same community by Messenger (3) also failed to show gains in I.Q. Messenger's group was chosen on the basis of socioeconomic status comparable to that of preschool children. The initial levels of ability were similar to those of the preschool children.*

Since the changes made by the two Iowa City nonpreschool groups and by the preschool children during periods of nonattendance were similar, it seems that the tentative hypothesis is justified that they represent fairly well the changes in general by nonpreschool children of these levels of ability in this locality. It would not be safe at this point, however, to generalize from these groups to other localities where experiences may differ.

Are the changes due to parental characteristics?—Are there any parental characteristics that may be associated with the recorded changes? The only available measured parental characteristics for the Iowa City groups are the educational and occupational level of the parents. It has been demonstrated in various studies in the literature that occupation of father and educational level of the parents are positively related to I.Q. level of their children. Are the changes in I.Q. by preschool children related to these measures of socioeconomic and educational status?

A study by Coffey and Wellman (1) involved such comparisons on fathers' occupations for 417 preschool laboratory children. The children came preponderately from Occupational Level I, the professions. They were divided as follows: 278 children from Occupation I, and 139 children from Occupations II to IV, inclusive (semiprofessional and managerial, clerical, skilled trades, retail business, semiskilled occupations, minor clerical positions, minor business, and farmers).† These two groupings differed in mean I.Q. at the time the children entered preschool. The professional group had a mean I.Q. of 119.4 and Occupations II to IV had a mean I.Q. of 112.0. The changes in I.Q. from fall to spring were, however, similar. The children from the professions gained +7.1 points in I.Q., and the children from Occupations II to IV gained +6.1 points. There were 226 children from Occupation I for whom spring-fall changes were available, and 91 children from Occupations I to IV; neither group showed any appreciable change during this period of nonattendance. The mean changes in I.Q. were, respectively, −0.62 and +0.30 points.

Data on educational level of both parents were available for 464 preschool children. The mean I.Q. in the fall was higher for the children whose parents had a greater amount of formal schooling. There were 20 children whose midparent education (average of father's and mother's education) was 8 to 11 years, or less than a high-school education; 181, whose midparent education was 12 to 15 years; and 263, whose midparent education was 16 to 20 years. The respective mean I.Q.'s of the child groups were 105.4, 115.8, and 121.2. The changes in I.Q. from fall to spring were, however, very similar for these groups. The mean changes in I.Q. were, respectively, +6.9, +6.8, and +5.8 points.

These results give no indication that occupational level of the father or educational level of the parents was responsible for the type of changes made during periods of preschool attendance and nonattendance.

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* Messenger studied 22 Iowa City nonpreschool children over a 2-year period. Their initial mean I.Q. was 117.6 and their change in I.Q., −2.6 points. She also studied 17 Oklahoma nonpreschool children over a similar period. Their change in I.Q. was +0.3 points.

† There were no fathers in this group who were day laborers or employed in the slightly skilled trades. The classifications were made on a six-point scale devised by Florence L. Goodenough and published in *The Kuhlmann-Binet tests for children of preschool age: a critical study and evaluation*, University of Minnesota, Institute of Child Welfare Monograph Series, No. 2. Minneapolis, Minn.: University of Minnesota Press, *ca.* 1928. Pp. 146.

Are the changes attributable to heredity?—Extreme caution should be exercised when it comes to the matter of attempting to appraise the mental heredity of any individual. Certainly, it is not safe to assume that socioeconomic and educational level of parents constitutes an adequate measure of heredity.* This does not, however, deny the importance of heredity, if it were possible to measure it.

With these considerations in mind, we can proceed to examine the mode of operation of hereditary factors, if causative of I.Q. change. To be responsible for general level of I.Q. is one thing and to be responsible for changes in I.Q. is another, although the two are to some extent interdependent. If heredity is the cause of I.Q. change of preschool children, then it must operate in fluctuations, since some periods (fall-spring) represent greater gains in mental age than in chronological age, and other (spring-fall) represent ongoing mental development to just that amount so as to keep pace with advancing chronological age.

Such differences in heredity as may be represented by the differences between that selection of fathers in the professional occupations who send their children to preschool and that selection of fathers in occupations below the professions but above day laborers and slightly skilled trades who send their children to preschool appear not to affect I.Q. change of preschool children, in either the fall-spring or spring-fall periods. Likewise, such hereditary differences as are represented by the differences between the selection of parents with (*a*) grade-school completion and (*b*) college graduation appear not to affect I.Q. change of preschool children.

Are the changes maintained as the children grow older?—The maintenance of changes constitutes a separate problem from that of the validity of increases at the preschool ages. The hypothesis may be advanced that whether the changes in one period will be (*a*) maintained, (*b*) augmented, or (*c*) lost will depend upon conditions during the subsequent period. The present chapter has been limited to a discussion of the changes made during the preschool ages.†

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† Data on retests at the school ages are summarized in an article in the 1940 *Yearbook of the National Society for the Study of Education* (15). Briefly, the studies support the above hypothesis and show the effects of preschool attendance in later development up to college entrance.

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CHAPTER XV

FOSTER-FAMILY RESEMBLANCES IN INTELLIGENCE*

Barbara S. Burks

When, as in the human family, the biological background which we call "nature" and the environmental influences which we call "nurture" tend to correspond in quality, it is no simple problem to untangle their effects upon development. Do superior children occur oftener in superior homes than in mediocre or underprivileged homes mainly because of what they inherit biologically, or because of the stimulating example and educational opportunities furnished by their parents? Or, to put the problem more generally: how much do the mental differences found in random individuals owe to nature and to nurture respectively? How far can a favorable environment of a specified kind push mental development beyond the level that would have been reached in an "average" environment? How far can a specified unfavorable environment inhibit mental development? And, finally, to what extent do nature and nurture account for differences in the typical mental attainment of *groups* of persons—*e.g.*, those sorted according to occupational status?†

The first step in approaching a problem of complexity is to examine such facts as are normally obtainable to ascertain which hypothesis or hypotheses they definitely fit. This procedure may result in narrowing down the areas for later experimental attack. For the present problem, we have as a beginning the following facts:

1. High and low abilities show a strong tendency to cluster in family lines.

2. Close relatives (parents and offspring, or siblings) show greater resemblance in mental abilities than do more distant relatives (grandparents and grandchildren, cousins, etc.).

3. Familial resemblance for intelligence (whether measured by trait ratings, or by mental tests) is of about the same magnitude as for physical traits like stature.

4. The magnitude of familial resemblance in both physical traits and mental ability (correlation of about .50 for close relatives) is just what could be anticipated if the determining factors were *genes*, *i.e.*, the units of inheritance

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* The writer is deeply indebted to Prof. Lewis M. Terman for his counsel and encouragement throughout the conduct of this study, and to the Children's Home Society of California and the Native Sons and Native Daughters Central Committee on Homeless Children for their cooperation in securing subjects. Zena C. O'Connor and Florence Bathgate collaborated in the field work. See reference (1) for original publication.

† The question of difference between *groups* requires separation from that of *individual* differences. It would be logically possible that individual differences should rest largely upon differences in original endowment, yet that differences in ability found on the average, say, between electrical engineers and day laborers, or between their offspring, should depend largely upon differences in education. Only research on *each* of the questions can furnish the evidence needed.

that have been demonstrated in studies of laboratory animals and plants.

So far, so good, for the hypothesis of natural inheritance. None of these facts contradicts it. From them, the great biometrician, Karl Pearson, even went so far as to write in 1901: " . . . we are forced to the perfectly definite conclusion that the mental characters in man are inherited in precisely the same way as the physical" (6). It has been often enough pointed out since Pearson's heyday, however, that environment might simulate heredity in producing family resemblance.

The study of twins appeared to many investigators to be a way out of the ambiguity. As is now widely known by laymen and biologists alike, there are two kinds of twins, one kind derived from the cleavage of a single fertilized ovum, and thus "identical" in heredity, and the other kind derived from two fertilized ova, and thus like ordinary brothers and sisters in degree of hereditary "overlapping." If one-egg twins resemble one another distinctly more than two-egg twins do on physical and mental traits, this is taken as presumptive evidence that heredity is at work. Many studies of twins are now available, and these have dealt not only with intelligence, but with a wide variety of physical and mental traits. It is found that with most physical measurements, and that with some mental measurements, including intelligence, the one-egg twins resemble one another almost as closely as the reliability of the measuring instrument permits. On intelligence tests, twins of the "identical" type generally correlate about .90, which is as high as individuals would correlate with their *own* scores if retested after a period of time. Two-egg or "fraternal" twins, on the other hand, generally correlate about .50 or a little above, a value close to that ordinarily obtained in studies of siblings.*

Such results do give weight to the "nature" hypothesis, but they are not conclusive, and especially they leave in doubt the *degree* to which "nurture" is operative. For it is quite possible that the resemblances shown by both the identical and the fraternal twins owe something to the environment. Moreover, identical twins really have a somewhat more similar environment than do fraternal twins, even if reared in their own homes by their own parents. It is shown, for example, in a California study by Wilson (10) that identical twins are treated more similarly by their relatives and friends and are more similar in habits of eating, sleeping, and recreation. While such factors would presumably not affect traits like eye color and fingerprint patterns and other physical traits which, because of their stability in the individual, are actually used as criteria for judging whether twins are of one-egg or two-egg origin, they might account for at least part of the greater similarity of identical twins in mental development.

When, in the early 1920's, studies of foster children (or of adults who had been reared in foster homes) were undertaken by several independent investigators (1, 3, 9), it had long been recognized that this approach would yield evidence more nearly crucial than any yet available. With foster children, in contrast to the situation of children who grow up in their own families, the hereditary background and the environmental influences are separated as to source. Comparisons of the resemblance of foster siblings or of foster children and foster parents with the resemblance obtaining between real siblings or between children and their own parents and appraisal of the development of the foster children in the light of the cultural and training factors that can be identified in the foster home background open the way to quantitative formulations on nature and nurture not possible through data collected by other methods. Though deliberate experimental control of the home environments of children over a period of years for research purposes does not seem feasible, the use of foster children as subjects of study capitalizes upon the experiments carried on for social ends all around us.

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* It is not clear whether the slightly greater resemblance of fraternal twins over ordinary siblings that has appeared in several studies is an artifact due to imperfect age standardization of the mental tests employed, or an indication of greater similarity in the environment of twins than of singly born siblings.

The writer's investigation (1), upon which the present chapter is based, was one of the earliest of the foster-child studies. Its emphasis was upon foster-parent-foster-child resemblances compared with ordinary parent-child resemblances, although foster siblings (unrelated children growing up in the same home) were also studied whenever they were encountered in the homes visited. In addition to mental tests of children and parents, or foster parents, data were obtained regarding the socioeconomic and cultural status of the homes. Even though such factors show fairly high correlations with parent intelligence, the relationship is far from complete, and we wished to know whether they made any demonstrable contribution to children's mental development over and above the contribution of parent intelligence.

Subjects and Methods

Several methodological decisions were made during the planning stage which we believed would sharpen the significance of the results obtained.

1. Selective placement* was to be reduced to a minimum by using as foster subjects children who were placed in their foster homes before the age of twelve months (the average age proved to be only three months). Their true parents (as far as was definitely known) and their foster parents were to be of the white race, non-Jewish, and American-, British-, or north-European-born.†

2. For a more precise comparison between foster and "own" children than would be possible by contrasting the foster data only with previous data collected by a variety of methods, a "control" group of parents and their own children was to be studied by exactly the same procedures as the foster group. The children of the control group were to be matched with those of the foster group for age, sex, and proportion who had not yet entered school; the natio-racial criteria for the parents were to be the same as in the foster group; and the control families were to be matched with foster families for locality, type of neighborhood, and occupational field of father. Only half as many control families as foster families were needed, however, to provide results of the desired "reliability" on most of the important relationships under scrutiny. This was because the relationships between child's intelligence and the home background factors tended to be higher in the control than in the foster families, and thus the "sampling errors" of the correla-

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* By "selective placement" we refer to the "matching" attempted by social agencies in fitting a child to an adoptive home. Natio-racial derivation, complexion, religion, and to some extent socioeconomic status and inferences regarding mental status were considered when placements were made. If a child was old enough to be tested (this was prior to the time that social agencies were using infant tests), his mental-test standing as well as the background data influenced the placement. (None of our subjects were old enough for tests at time of placement.)

† Natio-racial homogeneity was desired because many studies have shown a mental test score advantage of white over nonwhite, Jewish over non-Jewish, and north European over south European. Selective placement according to natio-racial origin might therefore introduce foster-parent-foster-child correlations irrespective of environmental influence.

tions were about the same in both groups.*

3. The foster parents (or parents of the control group) must be alive and living together at the time of the study. In the foster group, moreover, the children must be legally adopted—not merely cared for in free or boarding homes.

4. Children must fall between the ages of five and fourteen inclusive—this being the age range within which I.Q.'s computed simply as mental age/chronological age were most nearly comparable.†

As finally obtained, the groups included 214 foster children and 105 control children. All but 11 of the foster and 3 of the control were living in urban or suburban communities. The families who actually participated represented a fairly high proportion of those whose cooperation was sought. In the foster group, 80 per cent of available families gave full cooperation, permitting tests of the child and both parents; an additional 8 per cent permitted tests of the child and one parent. In the control group, 94 per cent gave full cooperation and an additional 4 per cent gave cooperation from the child and one parent.

We were vitally concerned to know whether, despite the care used in selection of the foster-children group, "selective placement" might still be sufficiently intrusive to cause difficulty of interpretation. By comparing the social histories of the children with their mental-test status ascertained during the course of the study and with the mental-test status of their foster parents, we concluded that selective placement could have had very little effect upon the correlations between the children and their foster parents—probably not more than 2 or 3 points in the second decimal. It is very likely, however, that the *average level* of intelligence found for our foster group was elevated a little by the fact that relinquished children known to have very unpromising parentage, or to show signs of mental deficiency themselves, were not placed in foster homes by our cooperating social agencies unless they gave later evidence of normal development. Such cases would have been excluded from our group by the criterion of placement age under twelve months.

In the field-work schedule, the items of major interest were the following: Stanford-Binet test administered to foster parents, control-group parents, and children; a home information blank (filled out by field visitors) containing an adaptation of the Whittier Scale for Home Grading and a scale for appraising cultural level of the home; personal information blank filled out by each parent. The Whittier Scale emphasizes the material status of the home (having sections on "Necessities," "Neatness," and "Size" of home), but also includes sections on "Parental conditions" (*i.e.*, status and marital harmony), and on "Parental supervision." The culture scale devised for use in this study included sections on "Speech," "Education of parents," "Interests of parents," "Home library," and "Artistic taste." The Whittier index and our culture index, and even the sections included within each, are not wholly independent of one another. A home environment has *structure*, and the diverse items that go into its appraisal are merely arrows aimed from various directions at the same target.

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* The probable errors of the correlation coefficient were computed by the well-known formula $(1 - r^2)/\sqrt{n}$, where r is the correlation and n the number of cases. If the study were being done now instead of in 1923–1927, the z transformation of r and its probable error would have been used instead, in order to obtain a "normal distribution" of sampling fluctuation and facilitate interpretation of the results.

† The 1937 revision of the Stanford-Binet test (7), with corrections introduced for I.Q.'s at chronological ages beyond fourteen, was of course unavailable at the time of our investigation.

How were the groups of foster parents and foster children, control parents and control children, composed?

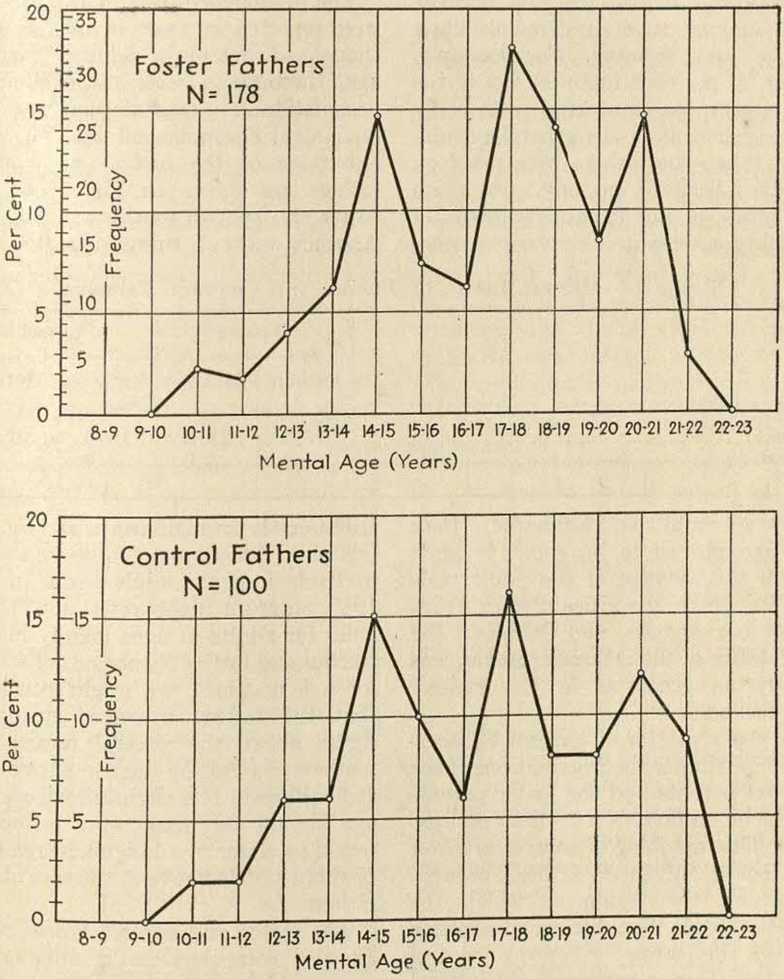

FIG. 1.—Mental-age distributions of foster fathers and control fathers. (*From the Twenty-seventh Yearbook of the National Society for the Study of Education. Part* I, 1928, *p.* 265.)

Whatever quantitative conclusions we may attempt to draw from the study are related to the degree of homogeneity of the groups serving as subjects. The greater the proportional variation in their environmental background, the greater is the proportional contribution of nurture to their mental differences. In our groups, consisting mainly of urban California families, environment could hardly have had as large a proportional effect as if the families of underprivileged southern Negroes, poor mountain whites, and Australian bushmen had also been included. But it is equally probable that the proportional effect was greater than if parents, and foster parents, had all been selected from a narrow range of socioeconomic status *e.g.*, teachers who were college graduates.

Judged first by occupation, the foster fathers (and the control fathers who were chosen so as to have a similar distribution) tended to be in occupations making superior demands upon ability and training. For example, about 20 per cent followed one of the professions, as compared with only 3 or 4 per cent in the general population. When the fathers were rated on the Barr Scale (8, pp. 66*ff.*), by which the grade of intelligence required for ordinary success in their various occupations could be estimated, their average proved to be about 1 sigma above the average of the adult male population in the cities of San Francisco, Los Angeles, and Oakland. The variability of the ratings, however, was nearly as great as in the general population.

It was a matter of concern to ascertain how similar the distributions of the control parents and the foster parents might be on factors *other* than occupation. The matching of control to foster was based only upon father's occupation and the region in which the families lived. Would these be sensitive enough indicators to ensure control families who as a *group* showed cultural status and mental attainment comparable to the foster families? If not, the interpretation of the correlations with mental level of children would be complicated since, as already pointed out, correlations are dependent upon degree of homogeneity in the population studied.

The intelligence tests of the parents were reported in years of mental age, though of course in adults "mental age" becomes a *score* rather than a designation of mental maturity at equivalent chronological age. The distributions of the foster and control fathers are shown in Fig. 1, of the foster and control mothers in Fig. 2.* Another way of comparing the distributions is through means and sigmas (standard deviations). These are shown in Table 1. If the adult norms of the 1937 Stanford-Binet revision (7) are valid for adults of ages mainly in the thirties and forties (hence out of school for a long time), we might conclude that the fathers averaged nearly 1 sigma above the general mean; the mothers ¼ to ½ sigma above the general mean. If a slight allowance for age should be made, our estimates would be closer to a 1-sigma increment, possibly a little above in the case of the fathers.

TABLE 1.—MENTAL LEVEL OF FOSTER AND CONTROL PARENTS

	Foster		Control	
	Fathers	Mothers	Fathers	Mothers
Mean	17.0	15.8	16.9	16.3
Sigma	2.6	3.0	3.0	2.8

The foster and control homes were likewise compared on a number of other variables which might conceivably have some importance in determining the development of the children's intelligence. In general the distributions were quite similar for the foster and control, *e.g.*, on Whittier ratings, cultural ratings, education of parents, and a number of other variables. The family income, however, averaged about $2,000 higher in the foster group than in the control group and had also a greater dispersion. This was probably accounted for in part by the fact that the foster fathers averaged five years older than the control fathers and had thus had a little longer time in which to reach their peak of earning power. Probably, too, economic considerations entered into the decision of foster parents to adopt a child. In any event, correlations in which income enters cannot be considered entirely comparable in the foster and control groups, but this fact is not of great importance because the correlations with income are not high.

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* The irregularities seen in the frequency polygons are mainly due to limitations of the 1916 Stanford-Binet as a test for adults. An empirical correction was applied to "mental ages" above 16 (8, pp. 42*ff.*) which compensated in part for the lack of "ceiling" in the test for the most superior cases. This resulted in somewhat uneven polygons. The effect would be to lower the reliability of the test slightly but not to disturb correlations seriously.

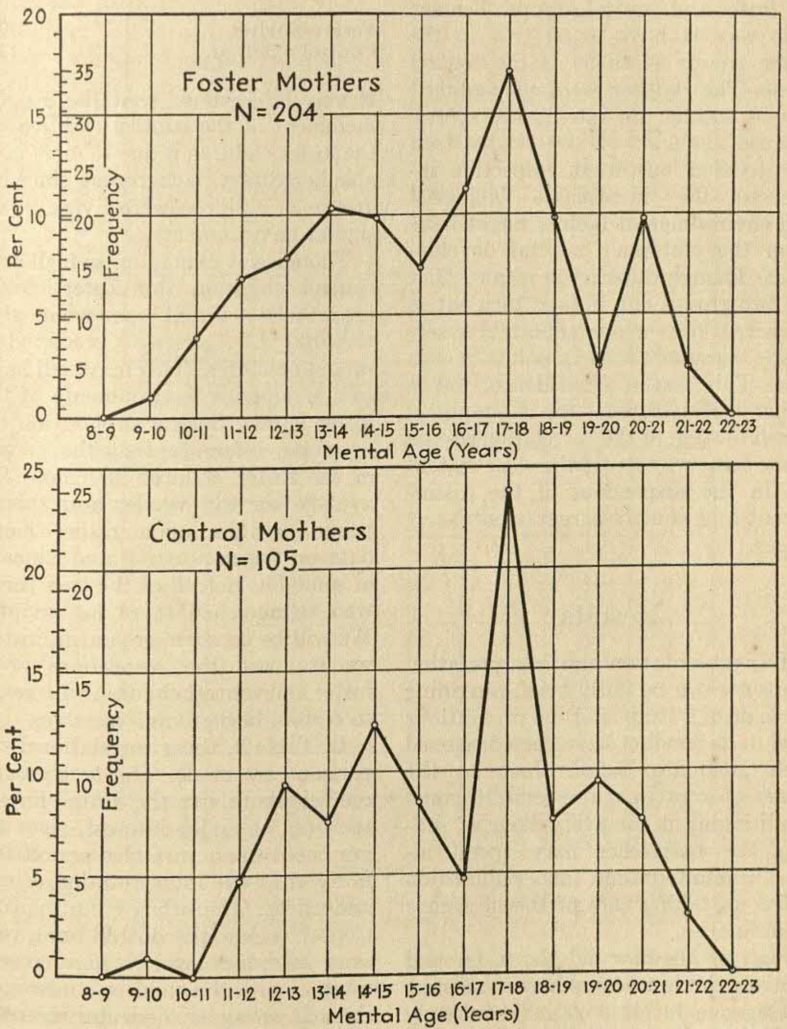

FIG. 2.—Mental-age distributions of foster mothers and control mothers. (*From the Twenty-seventh Yearbook of the National Society for the Study of Education, Part* I, 1928, *p.* 266.)

The methods of selection ensured children in the two groups who were highly comparable in age and sex distribution. The mean age was 8.2 years and the sigma 2.6 years in both the foster and control groups. The sex ratio was 41 boys to 59 girls in the foster group; 44 to 56 in the control group. The children were not matched to one another on intelligence scores, because the aim of the study itself was to find out what respective influences the identifiable biological and environmental factors might have upon the children's mental development. Though differing in mean I.Q.'s, the two groups did, in fact, turn out to have I.Q. dispersions almost precisely alike—sigma of 15.1 I.Q. points in each case. This was a coincidence, but a rather fortunate one, for it simplified interpretation of the correlation results in the same way as did the close matching in the dispersions of the foster-parent and control-parent mental-test scores.

Results

The presentation and interpretation of results can be fairly brief, providing the logic of a study and the precautions used in its conduct have been discussed with adequate detail. Just as the owner of a yacht may spend 10 hours conditioning it for every hour of sailing, the researcher may spend almost unlimited time (and publication space) in taking care of the necessary preliminaries.

First of all, how did the foster and control children compare in average intelligence level? (We have already mentioned that they were alike in dispersion, with sigma of 15 I.Q. points.)

The I.Q. distributions are shown in Fig. 3.* From these distributions the means were found to be:

Foster children	107.4
Control children	115.4

It may be assumed that the 8 points' increment of the control children over the foster children is due to more favorable hereditary background, since both groups of children were living in very similar environments.

Though not averaging as high as the control children, the foster children nevertheless tested somewhat above the 100 I.Q. average predicted for random children. This may well be due to the superior environments of their foster homes. Such a supposition rests upon the inference that the heredity of the foster children was not above average on the whole, and this depends in turn upon rather meager data on the occupation and education of some but not all of the true parents who relinquished them for adoption. We will be on safer ground if, instead, we compare the *correlations* of the foster and control children with respect to certain background variables.

In Table 2, these correlational comparisons are made. The first group of coefficients (above the dotted line) are the ones of major interest, since they are based upon variables permitting a fairly clear-cut interpretation of cause and effect. The other group of coefficients† (below the dotted line), represent variables which may possibly interact with the children's intelligence in such a way as to render the results ambiguous. For example, do the books in a child's library stimulate his I.Q., or does the child of high intelligence tend to collect more books about him? One could hardly answer such a question unless he knew the circumstances under which the child's books were acquired.

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* The greater irregularity in the frequency distribution of the control group is probably due to the smaller number of cases, with consequent sampling fluctuation.

† The final correlation coefficients in this table, showing the amount of agreement between parents' estimates of the children's intelligence and the children's measured I.Q.'s, are included only for their incidental interest. Though the coefficients are not high, the estimates give about as good agreement with I.Q. of children as do teachers' estimates of the intelligence of their pupils.

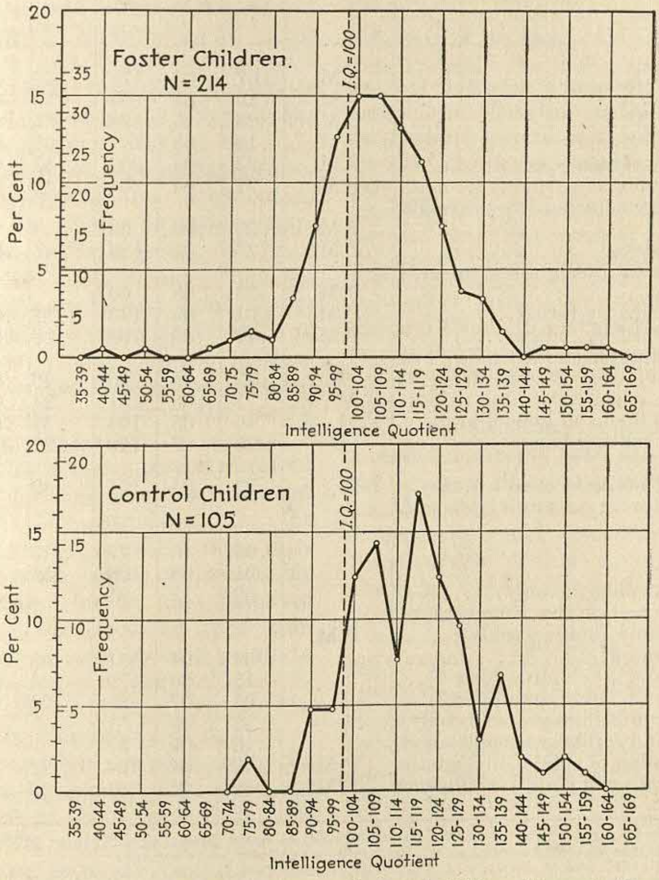

FIG. 3.—I.Q. distributions of foster children and control children. (*From the Twenty-seventh Yearbook of the National Society for the Study of Education, Part* I, 1928, *p.* 262.)

Considering the first group of variables, which include the various measures of parent intelligence and home status, we find striking differences between the foster and control groups. With every variable except family income, the correlation in the control group is appreciably higher. The most interesting correlations of all are between parent and child intelligence. The control correlations are about .45, not far from the values reported in previous studies for both physical traits and intelligence. But in the foster group the correlation does not differ significantly from zero for the fathers and is less than .20 for the mothers. The "midparent"* correlation of .20 in the foster group means that only 4 per

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* The midparent score is simply the average of the father's and mother's score and is often used to show how well the scores of offspring can be predicted by considering information on both parents at once.

TABLE 2.—CHILD'S I.Q. CORRELATED WITH ENVIRONMENTAL AND HEREDITARY FACTORS*

Factor	Type of *r*	Foster			Control		
		r	P.E.	*N*	*r*	P.E.	*N*
Father's M.A.	P.M.	.07	.05	178	.45	.05	100
Mother's M.A.	P.M.	.19	.05	204	.46	.05	105
Midparent M.A.	P.M.	.20	.05	174	.52	.05	100
Father's vocabulary	P.M.	.13	.05	181	.47	.05	101
Mother's vocabulary	P.M.	.23	.04	202	.43	.05	104
Whittier index	P.M.	.21	.04	206	.42	.05	104
Whittier index (using five-year-olds only)	P.M.	.29	.08	63			
Culture index	P.M.	.25	.05	186	.44	.05	101
Culture index (using five-year-olds only)	P.M.	.23	.08	60			
Grade reached by father	P.M.	.01	.05	173	.27	.06	102
Grade reached by mother	P.M.	.17	.05	194	.27	.06	103
Parental supervision rating, 3 or 4 vs. 5 or 6	B.	.12	.05	206	.40	.09	104
Income	P.M., K.	.23	.05	181	.24	.06	99
Number of books in home library	P.M., K.	.16	.05	194	.34	.06	100
Owning or renting home	B.	.25	.07	149	.32	.10	100
Number of books in child's library	P.M., K.	.32	.04	191	.32	.06	101
Private tutoring (in music, dancing, etc.)	B.						
Boys		.06	.10	77	.43	.11	46
Girls		.31	.08	108	.52	.09	56
Five-year-old girls only		.50	.12	31			
Home instruction by members of household (hours weekly)	P.M.						
Ages 2 and 3		.34	.04	181	−.05	.07	101
Ages 4 and 5 (children over 5)		.15	.06	129	−.03	.08	71
Ages 6 and 7 (children over 7)		.03	.07	88	.24	.09	46
Ages 2 and 3 (five-year-olds only)		.18	.09	51			
Ages 4 and 5 (five-year-olds only)		.13	.09	52			
Father's rating of child's intelligence	P.M.	.49	.04	164	.32	.06	98
Mother's rating of child's intelligence	P.M.	.39	.04	181	.52	.05	101

* The following abbreviations are used in this table: M.A. for mental age, P.M. for product-moment correlation, B. for biserial correlation, K. for Kelley's auxiliary score method.

From *Twenty-seventh Yearb. nat. Soc. Stud. Educ.*, Part I, 1928, Chap. X, p. 278. Quoted by permission of the society.

cent* (the square of .20) of the I.Q. variability in the foster children can be explained by reference to the intelligence scores of their foster parents. The higher correlations in the control group must be due to the combined influence of heredity and environment, but, since the environmental contribution is seen through the foster data to be small, the contribution of heredity to the control correlations must be correspondingly large.

In order to reach an estimate of the total contributions of heredity and environment—and thus to answer the questions proposed at the beginning of this chapter—several additional steps were undertaken.

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* To students of correlation it is well known that in predicting scores on one variable from a knowledge of scores on a second correlated variable, the *square* of the correlation coefficient gives a numerical statement of the amount of variability in the first variable that can be accounted for by information on the second variable.

The correlation coefficients (of the first major group of variables) were corrected for attenuation, to eliminate the effect of random errors, *i.e.*, of test unreliability.* The variables (of parent intelligence and home environment) were then brought together by multiple correlation technique, to ascertain the maximum predictability of the children's intelligence. The multiple correlation† (corrected for attenuation) proved to be .42 in the foster group, .61 in the control group. We may square these, and conclude (from the foster correlation) that about 17 per cent of the differences in the I.Q.'s of the children is due to home environment (of the kind that can be identified and measured), and (from the control correlation) that about 37 per cent is due to the genetic component in parent intelligence and to home environment combined. The correlation for the foster group also permits us to infer that the total effect of measurable environmental factors one standard deviation (1 sigma) up or down from the average is only about 6 points in either direction (*i.e.*, the multiple correlation, .42, multiplied by 15, the sigma of the children's I.Q.'s).

If the multiple correlation in the control group accounts for only about 37 per cent of the differences in children's I.Q.'s, what accounts for the large residue? In the original study, the following line of reasoning was adopted:

> Possibly a portion of this residual variance is due to the "random somatic effects of environment" . . . but it seems reasonable to suppose that not a great deal is due to this effect, since numerous studies have shown a marked tendency for the I.Q. to remain constant over a period of years, while other studies have shown that identical twins correlate in intelligence about as closely as the reliability of the tests employed will permit. Probably the major share of the residual variance is due to congenital endowment, since in known modes of hereditary transmission the influence of heredity is *always* far stronger than parental correlations alone would indicate. This is necessarily the case because only half the chromosomes of each parent are passed on to the offspring . . . . Probably, then, close to 75 or 80 per cent of I.Q. variance is due to innate and heritable causes (1, pp. 303–304).

This quantitative contribution was admittedly not established "beyond cavil," but substantial confirmation of it came a number of years later through the Chicago data on identical twins reared apart (Newman, Freeman, and Holzinger[5]), and especially through Woodworth's critical appraisal and reworking (11, p. 57) of the Chicago twin data.

One other conclusion of interest should be mentioned, which was not offered at the time of the original study, but which came more than ten years later out of a reworking (2) of the original data, supplemented by data which had become available in the meantime in a study by Leahy.‡ The question was this: What are the relative contributions of nature and nurture to differences in the I.Q. level of *groups* of individuals? (*Cf.* introduction to present chapter, especially footnote, page 245.) It was possible to find an answer to this question for one important kind of group hierarchy made up of children whose fathers belonged to different occupational levels, *i.e.*, professional, business, and skilled to unskilled labor. There is ordinarily a difference of 15 to 20 points in I.Q. level of offspring of fathers from the two occupational extremes. A comparison was now made of the differences in I.Q. levels of the children whose *foster* fathers belonged to these occupational groups, and the differences in the control children whose *own* fathers belonged to the same occupational groups. The differences in the control children were due to the *combined* effect of heredity and environment; those in the foster children only to environment. The differences in the control were much larger than in the foster—so much so that it could be calculated that the I.Q. differences in offspring classified by father's occupation owe about 75 per cent to nature, 25 per cent to nurture.

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* The formula for correction for attenuation $r_{12}/\sqrt{r_{1\mathrm{I}} r_{2\mathrm{II}}}$ gives an estimate of the correlation that *would* be obtained if perfectly reliable measurements could be secured; $r_{1\mathrm{I}}$ is the reliability of the first measure, $r_{2\mathrm{II}}$ of the second measure.

† A multiple correlation combines several variables (two or more), weighted according to their contributions, into a single score, which is then correlated against the variable which one wishes to predict, *i.e.*, children's intelligence in the present instance.

‡ The study by Leahy (4) was undertaken for the purpose of resolving some apparent disparities between the results of the writer's investigation (1) and that of Freeman, Holzinger, and Mitchell (3). The interested reader may wish to consult all three studies, and also Woodworth's evaluation of them (11).

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CHAPTER XVI

INTELLECTUAL GROWTH OF CHILDREN IN FOSTER HOMES*

MARIE SKODAK

Introduction

One of the most important factors in the development of a happy and mutually satisfying relationship between a child and his adopting parents is the child's mental development. It is obvious that a child's success or failure in meeting the standards of his new home, his progress or retardation in school, his ability or inability to follow an occupation acceptable to the adopting parents seriously influence his position in the foster family. Children who are born in established families and who grow up in the same homes follow certain fairly well established patterns in mental development. While a great many exceptions can be cited, in general sons of teachers and doctors tend to remain in the professional and managerial classes, the sons of carpenters tend to remain near the skilled and semiskilled groups, and the sons of laborers infrequently leave the ranks of the unskilled and slightly skilled. Is this because of an innate aristocracy of intelligence? Or is it because these children grew up in their fathers' homes? If the child of the unskilled, ignorant laborer were to be placed in the home of intelligent parents in the higher occupational ranks, would his development still be the same as if he had remained in his own home, or would it rather follow the pattern usually found among children who are born into homes of this caliber? Since both hereditary and environmental factors influence the child's development in his own home, no amount of sequential study of own children can answer this question. The different social strata present complex environmental situations in which parental intelligence, differential social opportunities, and differential educational opportunities are constantly interacting.

If, however, infants known to come from underprivileged family backgrounds are placed in homes known to be average or above average in terms of certain criteria, where they are raised as members of the family, having known no other environment, then the course of their mental development can give at least a partial solution. This study is one of a series of reports of such a social experiment.

In Iowa the largest public child-placing organization is the State Board of Control through its Bureau of Child Welfare. To this state organization may be committed dependent children from any county, and the two state orphanages are obligated to accept these children regardless of social history. The Iowa Children's Home Society, a private agency, also operates on a statewide basis, but is somewhat more discriminating in the family background and mental status of the children it accepts. In 1934 the state agency recognized the need for psychological service to its wards and set up a department of psychology with a part-time director and full-time assistant. Shortly thereafter the private agency requested and received the same type of service from the Iowa Child Welfare Research Station. Both organizations were particularly interested in those children to be released for adoption and wished to utilize psychological tests by means of which the child's level of performance may be assessed at an early age. His rating, considered together with his developmental history and the environment in which he lives, forms the basis for an acceptably accurate prediction of his future development. These tests were primarily for the guidance of the agencies and the foster parents and were routinely required for all children prior to the completion of adoption. The research studies have been by-products, but very important ones, of this service program.

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* A more detailed report of this study can be found in a monograph by the writer (3). Adapted with permission of *University of Iowa Studies in Child Welfare.*

When the practice of giving every child a mental test before the completion of adoption was instituted, the large number of unsavory family histories, with numerous cases of mental defect, led to the expectation that many of the children who had been placed in adoptive homes would be retarded. It was soon noticed that this was not the case. A survey made by Skeels (2) of the test results of 147 children confirmed the general impression of superiority made by the children. Since the majority of the children were less than two years of age when given the first test several questions were raised. One with regard to the reliability of tests at these youthful ages challenged the value of the results either for predicting future ability or for assessing intelligence as it is known at the school ages. Another major question concerned the possible future course of the development of these children, with the implication that the high scores in infancy might not be maintained. The third problem concerned the relationships between the child's ability and various characteristics of his true and foster parents, such as the degree to which he resembles one or the other set of parents, whether these resemblances are like those of own children and their parents, and whether there are changes in degree of resemblance with age. Realistic answers to these questions can be secured only through following a group of children over a long period to learn what actually happens.

Procedures

Subjects.—In order to control as many variables as possible, only those children were included in this study who had been placed in adoptive homes under the age of six months, were of white, North European ancestry, and had had an intelligence test dated between January, 1934, and November, 1936, following a year's residence in the foster home. Altogether 180 children met these requirements, two-thirds of them from the public agency. Of these, four families refused to cooperate in retests, and 22 either could not be scheduled for retests, could not be located, or were known to have left the state. This left a group of 154 children who were given at least one additional test. Of these, 140 were illegitimate children, and approximately 90 per cent had been adopted by 1938. Actual age at placement ranged from two days to six months, with the average at 2.8 months.

Tests and Sources of Information.—The children were examined in their foster homes in familiar surroundings, usually with only the child and examiner in the room. The examiners were highly trained in working with young children, and good rapport was established without difficulty.

The 1922 Kuhlmann test was used with children under three and a half years and the 1916 Stanford revision of the Binet with those older. A large number of examinations had already been given when the more recent revisions became available, and it was considered inadvisable to change the tests used during the course of the study.

The information regarding the education, occupation, and general social history of the true parents had been collected from various sources and was found in various documents, such as reports from social agencies, hospitals, and clinics; correspondence from attorneys, county social workers, relatives, and the parents themselves. Intelligence-test scores based on the 1916 Stanford were available for 80 of the true mothers.

Information concerning the foster parents was secured from the foster parents. The data were checked with the information on the application blanks, references, and home-investigation and supervision reports in the files of the children. In all but one or two cases information on the education and occupation of the foster parents was complete, in addition to various other data on social history. No intelligence tests on the foster parents were available.

The occupational classification used in this study is that devised by Goodenough (1) and is based on the census classification of employed males in the United States. This makes possible comparisons between the distributions of various groups of employed males. In this scale the categories are as follows:

Group	Occupation
I.....	Professional
II.....	Semiprofessional and managerial
III.....	Clerical, skilled trades, and retail business
IV.....	Farmers
V.....	Semiskilled occupations, minor clerical, and minor business
VI.....	Slightly skilled trades, occupations requiring little training or skill
VII.....	Unskilled laborers, urban and rural

TABLE 1.—EDUCATION OF TRUE AND FOSTER PARENTS OF CHILDREN PLACED UNDER SIX MONTHS OF AGE

School attainment	True fathers		True mothers		Foster fathers		Foster mothers	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
20	.....	....	.....	....	8	5.2		
19	.....	....	.....	....	1	0.7		
18	.....	....	.....	....	5	3.3	1	0.7
17	.....	....	.....	....	5	3.3	4	2.6
16	2	2.3	1	0.7	13	8.5	15	9.9
15	2	2.3	0	0.0	8	5.2	7	4.6
14	3	3.4	3	2.1	4	2.6	14	9.2
13	6	6.8	12	8.3	16	10.5	19	12.5
12	21	23.9	32	22.2	27	17.7	38	25.0
11	7	8.0	14	9.7	4	2.6	6	4.0
10	8	9.1	19	13.2	10	6.5	17	11.2
9	7	8.0	12	8.3	11	7.2	6	4.0
8	22	25.0	31	21.5	38	24.8	19	12.5
7	6	6.8	14	9.7	2	1.3	4	2.6
6	1	1.1	3	2.1	0	0.0	1	0.7
Less than 6	3	3.4	3	2.1	1	0.7	1	0.7
Unknown	66	....	10	....	1	....	2	
Total	154	....	154	....	154	....	154	
Mean	10.2	....	9.9	....	12.0	....	12.0	
Standard deviation	2.5	....	2.2	....	3.8	....	2.7	
Median	10.6	....	10	....	12	....	12	

Results

Description of True Mothers. *Education.*—Information was available on the education of 144 of the mothers. As shown in Table 1, the mean grade was 9.9 with a median of tenth grade. Later evidence showed that these results are probably spuriously high. A careful check showed that in a similar group of mothers about half gave school grades two or more semesters higher than they had actually attained. In addition many are known to have been overage for grade and some were "lifted" into higher grades regardless of ability because there were no opportunities for special education.

Occupation.—Information was available on the occupational status of 115 of the 154 mothers. Considering only those cases for which information was available, 22 or about one-fifth had been too young to have been employed, were students living at home, or were mentally incapable of holding positions. Thirty-eight, or about one-third, had done housework only. The remainder were distributed in such occupations as waitress, factory or packing-plant employee, telephone operator, store clerk, rural teacher, etc. These results agree with most studies of illegitimacy, which have found that the majority of the mothers have been employed in unskilled and semiskilled occupations, with a high proportion having had experience only in domestic service.

Mental Level.—Intelligence-test results on the 1916 Stanford were available for 80 of the 154 mothers. Previous study (2) of a sample from this group had indicated that these mothers could be considered representative of the total group, since both examined and unexamined mothers were similar in educational, occupational, and general social backgrounds.

The following tabulation represents the distribution of the maternal I.Q.'s: The preponderance of mothers from the lower levels of intelligence is shown by the fact that only 6.2 per cent have I.Q.'s above 110, whereas 53.8 per cent have I.Q.'s below 90.

I.Q.	Number	Per cent
120 to 129	2	2.5
110 to 119	3	3.7
100 to 109	10	12.5
90 to 99	22	27.5
80 to 89	19	23.8
70 to 79	13	16.2
60 to 69	9	11.3
50 to 59	2	2.5
Unknown	74	
Total	154	
Mean	87.7	
Standard deviation	15.8	
Median	88.7	

Social Status.—With the exception of a very few mothers, the social status of the group as a whole was markedly inferior. Statements such as the following selected at random from the history records indicate the general level of the group. "Family has been known to welfare agencies for years. Shiftless, improvident, uncooperative." "This girl was herself an illegitimate child. Her two sisters have each had illegitimate children placed through the *X* home." "Mrs. K. had been married and had raised a fairly nice family with the help of her mother-in-law. After the old lady died the family disintegrated, and when her husband died Mrs. K. became very promiscuous. The father of this child could be any one of a number of men who frequent a certain low-grade tavern."

A large number of the families were on relief or lived in financial insecurity so marked that it was considered a major factor in making plans for the child. While the number of cases in the immediate family with records of mental defect, of dependency involving institutional care, or arrests and incarcerations was larger than would be found in a sample of the same size from the general population, still the group is not so inferior in social status as the families of children committed and placed at an older age.

Description of True Fathers. *Education.*—Cases where identification of the father or the information concerning him was doubtful were considered "unknown" and were not treated in the analysis of the data. Information was available on the educational attainment of 88, or 56.4 per cent of the 154 fathers. The distribution is shown in Table 1. The mean and median were slightly over tenth grade completed, 10.2 and 10.6 respectively. In the case of the fathers, as in the case of the mothers, there is reason to believe that the actual educational attainment was not so high as the school grade reported reached.

Occupation.—No information was available on the occupations of 35 of the 154 fathers. Nine were reported to be students in high school or college with no occupational records. The remaining 110 were distributed in the seven occupational categories as shown in Table 2. The mean occupational classification of the true fathers is 5.4, which would fall between the slightly skilled and semiskilled and is about one occupational category below the average for the entire country. In many cases, although an occupation was given, the individual was actually unemployed and on relief. There appears to be sufficient evidence to conclude that within a given occupational classification the individuals in the group were the more inferior members of the classification.

TABLE 2.—OCCUPATIONAL CLASSIFICATION OF TRUE AND FOSTER FATHERS OF CHILDREN PLACED UNDER SIX MONTHS OF AGE

Occupational classification	General population employed males, 1930*	True fathers		Foster fathers	
	Per cent	Number	Per cent	Number	Per cent
I. Professional	3.1	2	1.8	21	13.6
II. Semiprofessional and managerial	5.2	5	4.6	35	22.7
III. Skilled trades	15.0	16	14.6	37	24.0
IV. Farmers	15.3	12	10.9	39	25.3
V. Semiskilled	30.6	12	10.9	13	8.4
VI. Slightly skilled	11.3	11	10.0	7	4.6
VII. Day laborers	19.5	52	47.3	2	1.3
Students	.....	9			
Unknown	.....	35			
Total	100.0	154	100.0	154	100.0
Mean	4.8	5.4	.....	3.1	
Standard deviation	1.5	1.8	.....	1.4	
Median	5	6	.....	3	

* From Terman and Merrill (4), p. 14.

Social Status.—The general social status of the true fathers was the same as that of the true mothers. In addition to the evidence from the occupational classification there was sufficient indication in the history records that the fathers, like the mothers, tended to come from families in which records of dependency and social inadequacy were not infrequent. The popular belief that the fathers of illegitimate children are markedly superior to the mothers cannot be substantiated on the basis of any available evidence. Both fathers and mothers come from the same levels of society.

Description of Foster Parents. *General Family Situation.*—At the time the children of this group were placed in the foster homes, both parents were living and the home was in general selected for stability and financial security. These conditions remained relatively constant or improved in all but four of the families. The foster homes were above average and superior homes in the community. Since the number of applications exceeded the supply of infants, both agencies were in a position to select only those homes which appeared to have the most to offer a child in the way of social and financial security, educational opportunities, and wholesome living. There were no families of extreme wealth or luxury. Many were considerably above the average in financial security, and it is noteworthy that during the period of depression and unusual crop failures which occurred at the time this study was in progress, somehow these families managed to be self-sufficient.

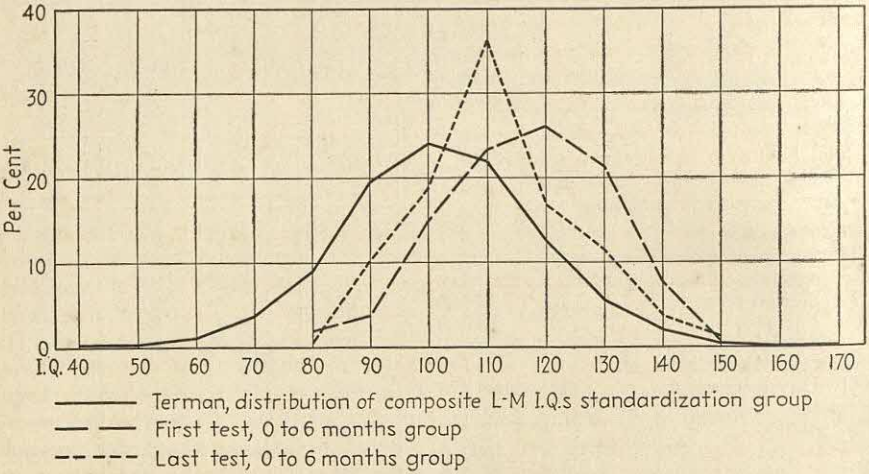

Fig. 1.—Distribution of I.Q.'s on first and last tests of foster children compared with Terman's 1936 results. (*From Univ. Ia. Stud. Child Welf.*, 1939, **16**, *No.* 1, *p.* 55.)

Qualitatively the homes may be characterized as socially minded, intelligent, and stable. In the references all comments are favorable, and the general trend may be judged from the following statements which have been selected at random from the files: "You can't find a better home in which to place a child." "These are intelligent young people who will give a child love, affection, and every educational advantage." "If a child of mine should become homeless, I could ask for nothing more than to have him find such a home."

Education of Foster Parents.—Distributions of the educational attainments of the foster parents are shown in Table 1. The mean for both fathers and mothers is twelfth grade completed. Comparison of these school attainments with those of the true parents shows the marked superiority of the foster parents over the true parents in educational attainment.

Occupational Classification.—Any system of classification which takes into account one factor only is subject to misleading interpretations when other factors are evaluated. In general the homes are selected within each occupational classification. The farmers are the more prosperous farmers, the carpenters the more industrious and capable ones, the laborers the best in their group, and so on. Even with these limitations the distribution of the occupations as shown in Table 2 is quite different from that of the population as a whole and markedly different from that of the true fathers. The mean occupational classification of the foster fathers is 3.1, which is approximately equivalent to that of highly skilled workman or retail-store proprietor.

Mental Development of Foster Children.—When the study was first planned it was hoped that the children could be examined annually, and in 26 of the 154 cases this was possible, giving these children three test scores. All the others had two intelligence tests. The following tabulation shows the distribution of the first and last test scores:

I.Q.	Test	
	First	Last
150 to 159	1	0
140 to 149	5	3
130 to 139	17	14
120 to 129	42	31
110 to 119	42	49
100 to 109	25	42
90 to 99	17	18
80 to 89	5	7
79 and below	0	0
Number	154	154
Mean	116.0	111.5
Standard deviation	13.6	13.2
Median	116.6	110.9

The distribution of the ages at which the tests were given is as follows:

Chronological age (months)	Test	
	First	Last
6 to 11	7	0
12 to 23	96	0
24 to 35	22	25
36 to 47	12	42
48 to 59	9	51
60 to 71	6	15
72 to 83	1	9
84 to 95	1	8
96 to 107	0	2
108 to 119	0	2
Number	154	154
Mean	25	52
Standard deviation	15.4	17.6
Median	19	49

The average age at the first examination was twenty-five months and the average I.Q. was 116. On the last examination the average age was fifty-two months and the average I.Q. was 112. There were no children whose I.Q. was below 80, and on both tests more than half of the children were above 110 I.Q. These results are not only above the average for children in general but compare favorably with scores made by own children from the most superior homes. Figure 1 shows a graphic comparison of the distributions of the test scores of these children as compared to the distribution of I.Q.'s in the general child population.*

The correlation between the two series of tests is .56 ± .04, which is as high as or higher than that found in other studies of the tests of young children. The difference between the means of the two test series is 4.6 points. The critical ratio of this difference is 2.99, indicating that a difference in the same direction can be expected in 99 of 100 similar samplings.

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* The *L-M* composite curve of distribution of I.Q.'s was selected for comparison since it "probably gives the clearest picture available of the intellectual differences which obtain among American-born children of the ages in question" (two to eighteen years; Terman and Merrill [4], p. 37). Since the curves of the distributions of I.Q.'s of foster children are based on both Stanford and Kuhlmann scores, no advantage would be gained by comparing them with a curve based on the earlier Stanford revision, which included fewer cases and many fewer children of preschool ages and was not so representative of the general population as the 1936 sampling. No curve for the distribution of I.Q.'s on the Kuhlmann test is available. Although it is recognized that the *L-M* composite curve may not form a completely satisfactory basis for comparison, it is more adequate than any other that is available.

Since there was a range of nearly 7 years between the youngest and oldest child tested, in order to ascertain whether the change might be related to age, all the test scores for all the children were tabulated as in Table 3. The average I.Q.'s were then computed. Beyond age five the number of cases was too small to warrant inclusion. It is seen that there is a sharp drop in mean I.Q. from one year to two years. The differences between two and five years are small and not significant statistically.

TABLE 3.—DISTRIBUTION OF I.Q.'S BY CHRONOLOGICAL AGE AT TIME OF TEST

I.Q.	Age, years				
	1	2	3	4	5
150 to 154	.....	1	.....	1	
145 to 149	.....	.....	1	1	
140 to 144	5	1	.....	1	
135 to 139	4	4	2	2	1
130 to 134	7	2	4	6	
125 to 129	17	6	3	5	1
120 to 124	10	8	7	4	7
115 to 119	6	13	7	10	1
110 to 114	11	13	13	9	5
105 to 109	9	6	5	7	5
100 to 104	4	8	2	10	2
95 to 99	2	5	8	3	3
90 to 94	1	3	.....	6	2
85 to 89	.....	2	3	2	1
80 to 84	.....	.....	2	1	
Number	76	72	57	68	28
Mean	120.4	114.0	112.3	113.0	110.6
Standard deviation	12.0	13.1	14.2	15.2	11.4
Median	122.0	114.1	113.0	112.3	110.5

Thus far it may be concluded that this group of foster children placed at an early age, and examined at two and at four years, is above the average in intelligence, with no child below the dull normal classification. The decrease in mean I.Q. from first to second test (116 to 112) is largely the result of a difference in mean I.Q. between the first and second years.

Relation between the Intelligence of Foster Children and Various Characteristics of Their Foster Parents. *Age and I.Q. of the Child and Foster Father's Occupation.*—This relationship was investigated since studies of children in their own homes showed that as the children grew older there was an increasing relationship between their mentality and their father's occupation. The test scores were tabulated according to both the child's age at time of examination and the occupation of the foster parents. Since the number of cases was small, it was advisable to combine the three upper occupational categories (professional, managerial, and skilled craftsman) and the four lower categories (farmer, semiskilled, slightly skilled, and unskilled). Figure 2 presents a comparison between these two divisions and the mean of the total group. At no time does the mean I.Q.

of children in the higher types of homes fall below the mean for the total group, nor does the mean for children placed in the relatively lower types of homes rise above the mean for the entire group. The differences between the means increase with age.

The results may be summarized as showing that during the first year of life children in relatively inferior homes do not differ in intelligence from children in relatively superior homes. During the next two years differentiation gradually appears, the children in the inferior homes losing in mean I.Q. and the children in the superior homes essentially maintaining their initial superior status. By the end of the third year the difference amounts to 10 points in I.Q. and becomes statistically significant. This difference is maintained during the remaining preschool years.

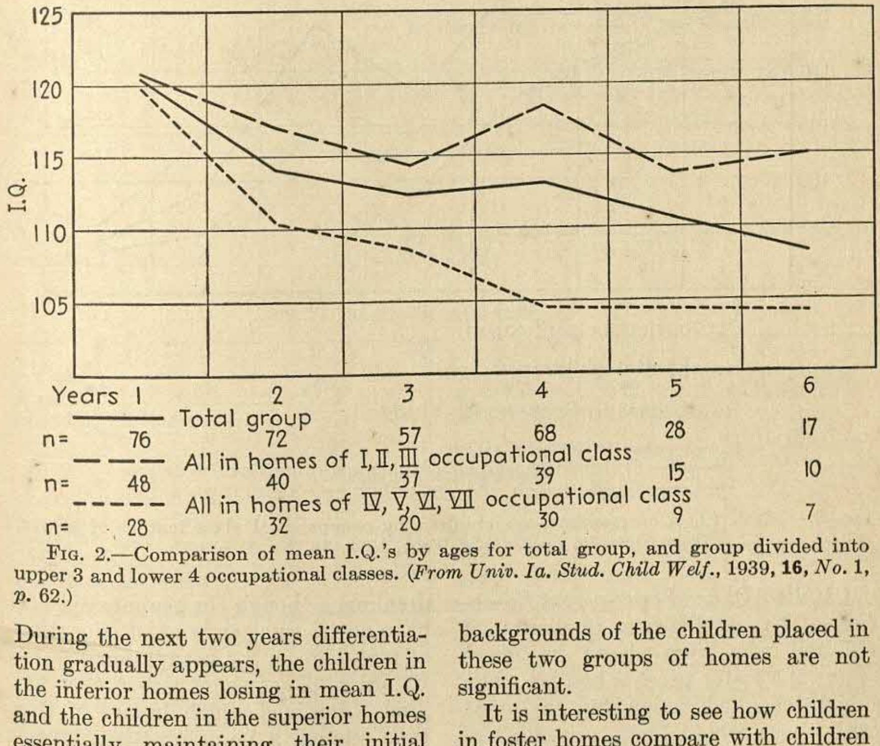

FIG. 2.—Comparison of mean I.Q.'s by ages for total group, and group divided into upper 3 and lower 4 occupational classes. (*From Univ. Ia. Stud. Child Welf.*, 1939, **16**, *No.* 1, *p.* 62.)

In considering this differentiation with age in relation to the occupational status of the foster parents, it must be remembered that all the homes in this study were selected within each occupational category and are not strictly representative of the population as a whole. The homes described as "inferior" here are inferior only in relation to the other homes in this study, not in relation to homes in general. The consistent superiority in mean I.Q. of all age and foster-father occupational groupings to that of the mean I.Q. of the population as a whole is no doubt the result of this selective factor. The differences between the true-family backgrounds of the children placed in these two groups of homes are not significant.

It is interesting to see how children in foster homes compare with children of the same age in their own homes when compared on the basis of their fathers' occupations. Terman and Merrill (4) and Goodenough (1) had examined children of two to five years and reported mean I.Q.'s for each occupational category. The test which fell most nearly in the same age group (two to five years) was selected for each foster child, and mean I.Q.'s were computed on the basis of the foster father's occupation. Comparison (Fig. 3) with the results of the mental tests of preschool children in their own homes (Terman and Merrill and Goodenough) shows that foster children follow the same general pattern of differences between occupational levels of the homes in which they are reared as shown by own children in similar homes.

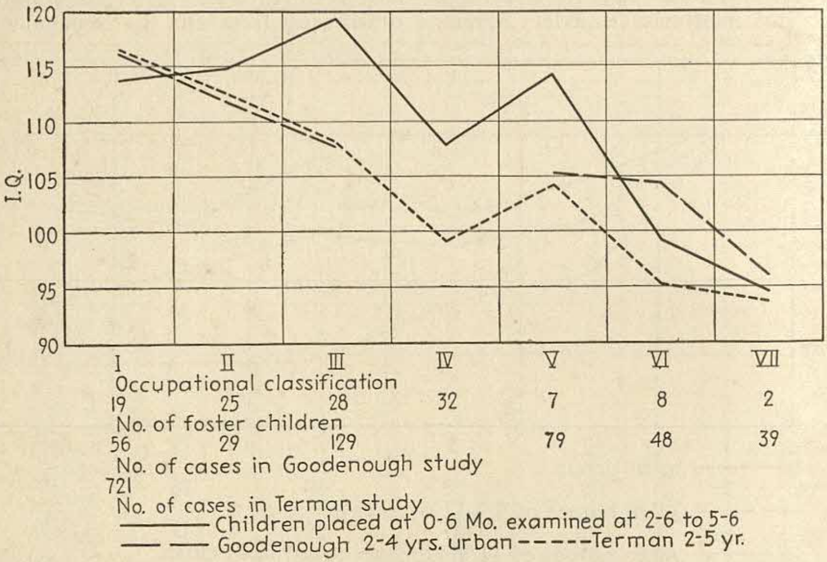

FIG. 3.—Mean I.Q.'s of preschool-age children by occupational classification of homes. (*From Univ. Ia. Stud. Child Welf.*, 1939, **16**, *No.* 1, *p.* 65.)

Child's I.Q. and Foster-parent Education.—The intelligence quotients of children who were placed in homes where the foster parents had less than a high-school education were compared with those whose foster parents had gone beyond high school. When the children are less than three years old there is little or no difference, and at four, five, and six years there is a small difference which might be reversed in one case out of ten if this experiment were repeated with similar groups.

Coefficients of correlation between the child's I.Q. and the education of his foster parents were greater with the second than with the first tests, but all range between .05 and .19, which is little better than a chance relationship.

These results indicate that during the first five years there is little relationship between the intelligence of foster children and education of their foster parents.

Child's I.Q. and Home Practices.—It was felt that some homes were highly stimulating intellectually to the children, even though the parents did not have an unusual amount of education or rank high in the occupational scale. In order to get some measure of the kinds of things which homes of this type offered, a home-practices inventory was devised. It covered the fields of play equipment, social contacts, language, behavior control, parental cultural interests and social participation, and an evaluation of the physical equipment of the home, together with an estimate of the general intellectual level of the environment which is the immediate setting of the child's life. It was found that children with I.Q.'s above 115 made scores which were an average of 18 points higher on this scale than those whose I.Q.'s were 104 or less. However, there was considerable overlapping between the two groups, and the correlation coefficient of .49 between I.Q. and home-inventory score indicates that more work needs to be done on the blank, its scoring, and the selection of the items before a final conclusion can be reached.*

TABLE 4.—RELATIONSHIP BETWEEN FOSTER-PARENT OCCUPATIONAL CLASSIFICATION AND TRUE-PARENT INTELLIGENCE, EDUCATION, AND OCCUPATION

	Foster father's occupational classification						
	I	II	III	IV	V	VI	VII
I.Q. of mother							
Number	13	18	15	19	11	2	2
Mean	87.8	95.6	82.7	87.8	86.6	70.0	75.0
Standard deviation	13.8	12.4	18.8	10.6	14.7		
Mothers' education							
Number	20	32	34	37	13	6	2
Mean	10.5	10.7	9.9	9.5	8.9	9.0	10.0
Standard deviation	2.0	2.0	2.3	2.4	1.7		
Fathers' occupation							
Number	15	29	24	29	8	4	1
Mean	4.9	5.5	5.2	5.9	5.1	5.3	7
Standard deviation	2.0	1.8	1.8	1.6	1.4		

Extent of Selective Placement.—If the child with the best true-family background were placed in the highest type foster home, and if a high degree of relationship exists between the family backgrounds of the children and the foster homes, then any relationship between the mental development of the children and the foster homes might be due to the selective placement. In the case of the children in this study, however, examination of the relationship between the occupational classification of the foster parents and various factors characterizing the true parents, as shown in Table 4, indicates that while selection occurred it was neither very marked nor consistent.

The differences between the mean I.Q.'s of mothers of children placed in the first five categories are not significant, and no conclusions can be drawn from the two cases in the sixth and seventh categories.

Comparison of the educational achievement of mothers whose children were placed in the homes of varying occupational categories showed a tendency for the children of better educated mothers to be placed in the better homes. Since the difference between the means of the highest and lowest education groups is about 1½ years of schooling and the overlapping is considerable in all the classifications, the difference is not meaningful.

The relationship between the mid-parent education of the true parents and of the foster parents shows a product-moment coefficient of correlation of .30 ± .07, indicating that a relationship which was slight, but positive, existed.

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* For details of this inventory see (3).

Relationships between true-parent and foster-parent occupations indicate that a slight selection existed in the first occupational classification, where the mean of the true parents was 4.9, while the mean for the remaining classifications ranged between 5.1 and 5.9. In no case was the difference statistically significant, nor was any consistent trend discernible.

Table 5.—Relation between True-parent Education and Child I.Q. on First and Last Test

	True-father education			True-mother education			Midparent education		
	Eighth grade or less $N = 32$	High school $N = 43$	Beyond high school $N = 13$	Eighth grade or less $N = 51$	High school $N = 77$	Beyond high school $N = 16$	Eighth grade or less $N = 21$	High school $N = 56$	Beyond high school $N = 10$
First examination									
Mean	115.9	115.5	116.6	113.1	117.6	116.4	114.2	115.4	120.5
Standard deviation	11.6	14.7	14.6	13.1	14.7	11.5	12.1	14.0	14.2
Median	117.0	117.0	113.0	115.0	117.0	115.0	115.8	117.0	119.5
Last examination									
Mean	106.7	110.6	118.3	107.2	112.9	119.5	104.2	111.0	122.0
Standard deviation	13.8	11.3	17.2	12.3	12.8	12.3	12.5	11.2	15.5
Median	107.0	111.2	118.3	107.0	112.5	117.0	104.0	110.5	117.0

If selection did occur, it was influenced by the objective factors described here. The social background of the mothers and fathers was adequately reflected by the educational achievements, intelligence, and occupational status. Practically no other basis of selection was possible, since in most cases this represented the sum total of the information available about the true parents. The most striking phenomenon is not the selection indicated by a correlation of .30 between midparent educations, but the uniformity of true-family backgrounds of children placed in varying types of foster homes. The children placed in the professional, and supposedly the highest types of foster homes, are not noticeably superior to children placed in the semiskilled and therefore supposedly lower types of homes with regard to true-father occupation, true-parental education, or maternal intelligence. Even had there been a desire to place the children selectively, this would not have been possible because of the concentration of the true parents in the lower levels of the available measures. In view of this uniformity in true-family background, the differences between the I.Q.'s of children placed in the varying types of homes become all the more significant.

Relation between the Intelligence of Foster Children and Various Characteristics of Their True Parents.—The relationship between the mental development of these children and their natural parents is interesting both because there has been virtually no contact between parent and child and because the relationships between foster-child intelligence and foster-parent education are lower than those reported for own families. However, even if some relationships exist, it is still not necessarily clear that these can be ascribed to heredity. They may be influenced by selective placement or may even be chance similarities resulting from insufficient numbers.

True-parent Education.—Information was available on the education of 88 of the fathers, 144 of the mothers, and in 87 cases of both fathers and mothers. The educational achievement of each father and mother and the midparent was compared with the intelligence of the respective child on first and last examination (Table 5). On the first examination none of the differences is statistically significant and in no comparison do the differences exceed 6 points in mean I.Q. On the last examination, however, the children whose parents had more education tend to be higher in mean I.Q. than those whose parents had less education. The differences of over 12 I.Q. points are statistically significant only in the comparisons between "eighth grade or less" and "beyond high school."

At the time of the first examination the correlations were of approximately zero order. At the time of the second examination the coefficients of correlation had increased slightly but were still substantially below those reported for own-parent-child comparisons in most studies, as the following summary indicates:

Relationship between	Number	Coefficient of correlation	
		First test	Last test
Child I.Q. and true-father education..........	88	.04 ± .08	.29 ± .07
Child I.Q. and true-mother education.........	144	.11 ± .05	.28 ± .05
Child I.Q. and true-midparent education.......	87	.08 ± .08	.33 ± .07

True-parent Occupation.—Evidence from various studies indicates that in infancy there is little or no relationship between child intelligence and family status but that a positive relationship appears by the end of the preschool period. It has been seen that a similar differentiation occurs in the case of foster children according to the type of foster home in which they have been placed. If the differentiation were due to inherent parent-child resemblances, which would become evident only after the period of infancy, then a division on the basis of the true-father occupation should throw considerable light on this problem. A child from inferior true-family levels should follow the pattern of his true father rather than the foster father.

The children whose true fathers came from the seventh occupational classification were selected and divided on the basis of foster-home occupational classification. The two lines of mental development were then compared with the trends shown by the group as a whole when divided on this basis. It is seen in Fig. 4 that instead of coinciding, as would be expected if the true-parent level would be the determining factor, the children of similar true parents placed in dissimilar homes fall on either side of the mean for the total group. The curves follow the same pattern as shown by all children in similar homes and give no indication of coinciding at a later date.

It may be concluded, therefore, that rather than the influence of heredity becoming manifest at the older preschool ages, the differentiation on the basis of family socio-economic level is primarily the result of the environmental influences to which the child has been exposed. Environmental handicaps reduce the mental level of the child in the inferior home as compared to his initial level as an infant, while the environmental advantages in the superior home make it possible for the child in that home to maintain his initial high level.

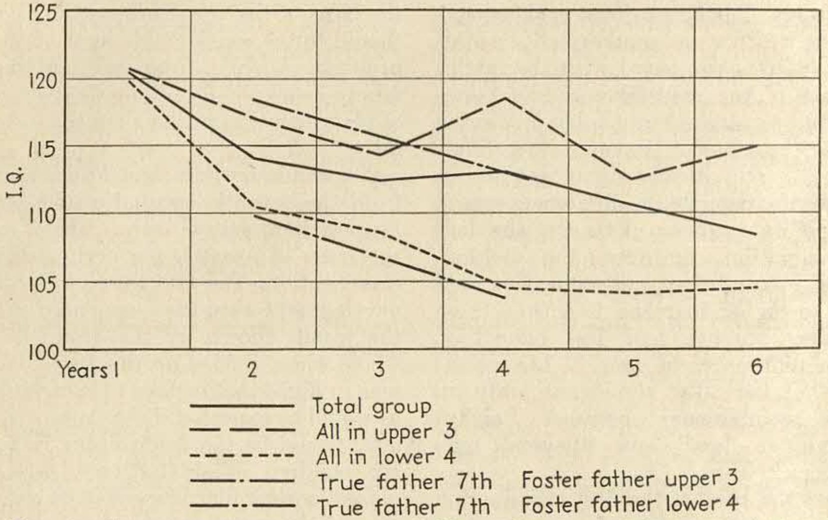

FIG. 4.—Comparison of I.Q. curves of children whose true fathers were in seventh occupational classification, divided into groups whose foster fathers were in upper 3 and lower 4 occupational classes compared with the mental development of all children in such foster homes and with the mental development of the group as a whole. (*From Univ. Ia. Stud. Child Welf.*, 1939, **16**, *No.* 1, *p.* 83.)

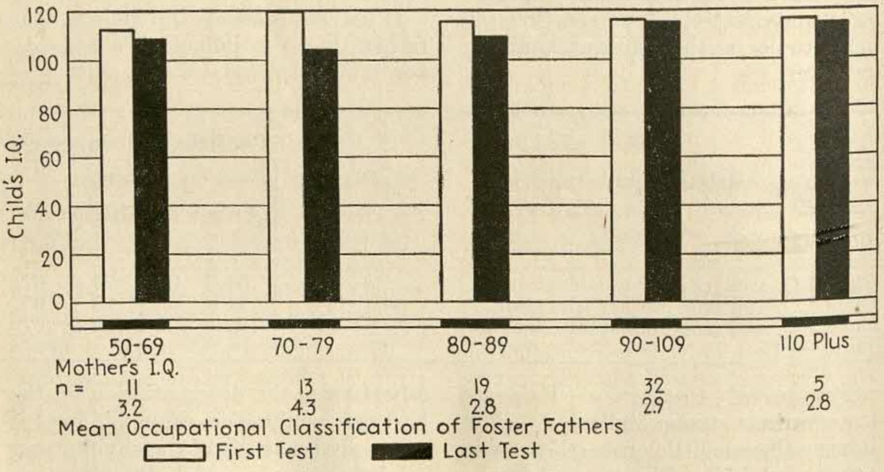

FIG. 5.—Comparison of mean I.Q.'s of children according to I.Q. of mothers. (*From Univ. Ia. Stud. Child Welf.*, 1939, **16**, *No.* 1, *p.* 86.)

Mothers' Intelligence.—The most accurate single measure of ability, the results of intelligence tests, were available for 80 of the mothers. Comparisons were first made between the I.Q.'s of children whose mothers' I.Q.'s were known and those whose mothers' I.Q.'s were unknown. It was found that the two groups were essentially similar. It was concluded that the children whose mothers' I.Q.'s are known are representative of the entire group of foster children from the standpoint of mental development and that conclusions based on analyses of the subgroup may be extended to the entire group.

The product-moment coefficient of correlation between the I.Q. of the mothers and the I.Q. of the children on first examination was .06 ± .08 and on second examination of the child it was .24 ± .07. Although there is an increase in relationship as the children grow older, it is still so small as to be inconclusive.

Another approach to the study of the relationship between maternal and child intelligence is through a comparison of the mental development of children whose mothers fell into the different classifications on the basis of intelligence. Thus the children whose mothers had I.Q.'s of 50 to 69 were grouped together; the same was done with I.Q.'s of 70 to 79, 80 to 89, 90 to 109, and 110 and above. The first and last test results of the children were then compared as shown in Fig. 5. It is seen from the results of the first examination that, regardless of maternal intelligence, all the children have mean I.Q.'s clustering around 117. The highest mean is found for the children of borderline mothers, with a mean of 120.1. On second examination, all groups show slight losses in mean I.Q. The greatest loss is made by the group which was highest on the first examination. The least loss is experienced by children whose mothers were average and above in intelligence.

In the interpretation of the changes between first and last examination for these groups, several factors must be considered in addition to the level of the mothers' intelligence. The children were placed somewhat selectively, in that children of mothers above 80 I.Q. were placed in homes of approximately 2.8 in mean occupational classification; while children of mothers between 70 to 79 were placed in homes of 4.3 and children of mothers between 50 to 69 were placed in homes of 3.2 mean classification. The tendency for the children initially highest in I.Q. to lose most, reinforced by the lower level of stimulation offered by the somewhat less adequate home as the child gets older, which may not have handicapped the child during infancy, may be sufficient to account for the differences between the groups of children without necessitating reference to the mothers' status.

Mental Development of Children Whose Mothers Are Feeble-minded.— Since the development of children whose parentage is known to be defective but who have nevertheless been placed in foster homes of average or above average status furnishes the greatest possible contrast between true-family background and environmental opportunity, the group of children whose background was known to be the poorest in the entire group was selected for special study. Sixteen children were available whose mothers ranged from 50 to 74 in I.Q. and had in addition been diagnosed as definitely feeble-minded on the basis of other criteria. The mean I.Q. of these mothers was 66.4, their mean education 7.6 grades. The mean education of the true fathers of the children was ninth grade and their mean occupational classification 6.3, or equivalent to very slightly skilled laborers. The social histories of the true families were strikingly poor, with many near relatives in state and local institutions, long records of family dependency, and other characteristics associated with familial inferiority.

These children were placed in adoptive foster homes whose mean occupational classification was 3.8, which is approximately half a category below that of the entire group of foster homes but still one category above that of the general population. The mean education of the foster fathers is 11.5 grades and that of the foster mothers 11.3, which is approximately one semester lower than the mean for the group as a whole. Thus some selection was operative in that the children were placed in homes slightly below the average of the entire group on the basis of occupation and education of the foster parents.

On the first examination the mean I.Q. for this selected group was 116.4 or practically identical with that for the group as a whole. On last examination, the subgroup had a mean I.Q. of 108 as compared to a mean of 111.5 for the total group. On both tests these 16 children were half a year older than the average for the total group.

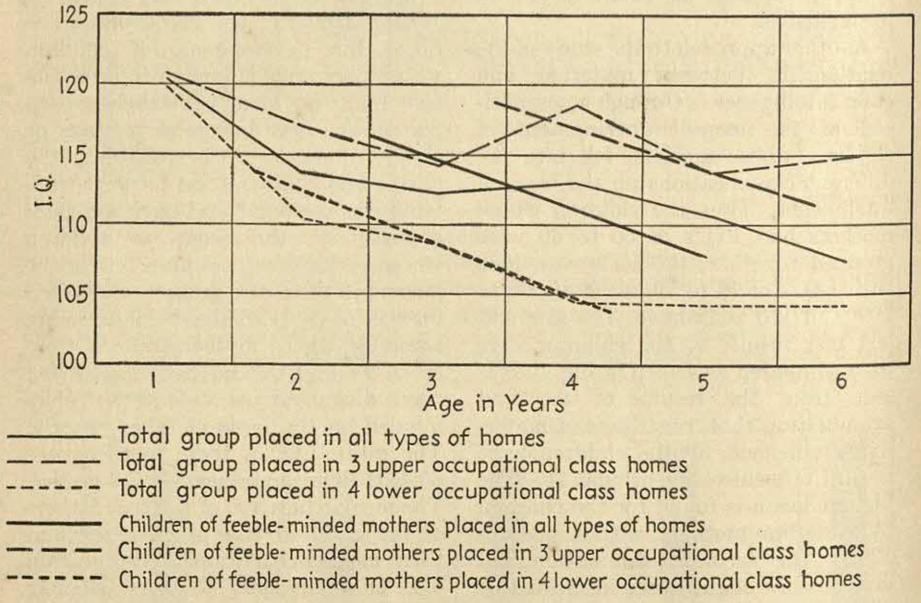

FIG. 6.—Comparison between mental development of children of feeble-minded mothers and total group of foster children, by age at test, mean I.Q. and foster children, by age at test, mean I.Q. and foster father occupational classification. (*From Univ. Ia. Stud. Child Welf.*, 1939, **16,** *No.* 1, *p.* 90.)

When the group of children whose mothers were feeble-minded was divided on the basis of the occupational classification of the foster parents, it was found that eight children had been placed in homes of the upper three occupational categories and eight in homes of the lower four categories. The eight children in the upper type of homes had a mean I.Q. of 118.6 when first examined at a mean age of three years, five months, and a mean I.Q. of 112.3 on last examination at a mean age of five years, seven months. The mean I.Q. of the eight children placed in the lower type of homes was 114.0 on first examination at a mean age of one year, seven months. Their mean I.Q. on second examination at the age of four years, no months, was 104.0 (Fig. 6).

Comparing these results with results for the total group by means of curves plotted on the basis of age, mean I.Q., and foster-father occupational grouping, it is seen that when the children of feeble-minded mothers are compared with children of all true-family backgrounds, who were examined at similar mean ages and in similar foster homes, the differences are insignificant. The children of the most inferior true-family background placed in homes of the three highest categories follow the same general pattern of development as children of all types of backgrounds placed in similar homes. Likewise, children placed in the four lower categories follow the same developmental pattern as do all children placed in such homes. The difference between the means for these two groups of inferior family backgrounds is the same as that for the two larger groups of all backgrounds.

It may be concluded that, when the mean I.Q.'s of children of mothers of different mental levels are compared, the differences in the children appear to be influenced more by the types of environments in which the children were placed than by the intelligence of the mothers. In comparing the mental development of children of known socially inferior backgrounds, no differences were found between the development of these children and the development of other children of varied backgrounds placed in similar homes and examined at similar ages. Thus mother's intelligence appears to have little if any influence on the mental development of a child who is removed from her care in early infancy.

Analysis of Consecutive Test Data.—It is apparent from the size of the correlation between first and second tests and from the changes in mean I.Q. from year to year that changes of considerable magnitude had occurred. Differences between first and last tests were as follows:

Difference in I.Q. between first and last examination	Cases	Per cent of total
Gained 26 to 30 points...	1	17.5
Gained 21 to 25 points...	4	
Gained 16 to 20 points...	7	
Gained 11 to 15 points...	10	
Gained 6 to 10 points...	5	
Gained 1 to 5 points.....	27	39.0
Changed 0 points........	7	
Lost 1 to 5 points........	26	
Lost 6 to 10 points......	20	42.5
Lost 11 to 15 points......	12	
Lost 16 to 20 points......	19	
Lost 21 to 25 points......	9	
Lost 26 to 30 points......	3	
Lost 31 to 35 points......	3	
Lost 36 to 40 points......	0	
Lost 41 to 45 points......	1	

Only 39.0 per cent of the cases changed within the limits of ±5 points, while 61.0 per cent changed more than that, gaining as much as 27 points and losing as much as 43 points. A total of 13.6 per cent of the children changed over 20 points in I.Q. This finding is interesting because earlier studies had stated that changes exceeding 20 I.Q. points were rare and would probably occur only under extremely unusual circumstances. These changes were found in homes which did not visibly change during the course of this study, and the children suffered no diseases or physiological changes which might account for the marked variations that occurred.

The questions which are then raised are (*a*) whether the children who were youngest lost most, (*b*) whether children who were originally brightest lost most, and (*c*) whether the children who were the youngest were also the brightest. To answer the third question, the children were grouped according to I.Q. on first examination and the average age for each I.Q. classification was computed. It was found that the five children under 90 were older than the 23 children with I.Q.'s of 130 and more, but the group between 90 and 130 was homogeneous in age. None of the differences was reliable and it was concluded that the relationship between age and I.Q. was no higher in this study than in others.

Regardless of initial I.Q., however, the younger children did tend to make greater changes than the older ones, as shown in the table at top of page 276. Both the decrease in range of changes and the shrinkage in critical ratio for older children point to the possibility that at the older ages the environment may exert a more constant influence or the individual may become less responsive to his environment. This may form the basis for the differences between this study and other researches that have found smaller changes between retests. This group is still young, plastic, and responsive. It may be that,

Age, years	Number	Mean I.Q. of children examined at these ages	Range of changes	Mean change	Standard deviation	Difference between mean changes	Ratio of difference to standard deviation of difference
1	69	120.4	+27 to −43	−9.6	14.1		
2	48	114.0	+22 to −22	−3.8	10.4	5.8	2.34
3	18	112.3	+27 to −22	+1.5	10.6	5.3	1.71
4 and up	19	110.0	+17 to −17	+0.1	7.9	1.4	0.45

as these children grow older, large changes between tests will also grow less frequent.

The following tabulation shows the relationship between I.Q. on first test and subsequent gains and losses:

Initial I.Q.	Number	Range of change	Mean change	Standard deviation	Difference between mean changes	Ratio of difference to standard deviation of difference
80 to 89	5	0 to +25	+12.5	9.45		
90 to 99	17	−7 to +27	+ 7.0	8.15	5.5	1.18
100 to 109	25	−17 to +25	+ 3.3	11.24	3.7	1.23
110 to 119	42	−35 to +22	− 5.9	11.35	9.2	3.21
120 to 129	42	−43 to +17	− 9.0	11.65	3.1	1.24
130 to 139	17	−35 to +12	−12.0	11.73	3.0	.89
140 and up	6	−32 to − 3	−17.2	10.65	5.2	1.00

While the differences between successive groups are statistically significant in only one instance (100 to 109 and 110 to 119), the trend is definite. The children who were initially the most extreme made the greatest changes. Children who were the lowest, between 80 and 89 I.Q., gained a mean of 12 I.Q. points, and it is of particular significance that no child of this initial level lost in I.Q. on subsequent examination. Children between 90 to 99 and 100 to 109 gained smaller amounts. In comparison with the population as a whole these children would be considered average and changes of this size would not be anticipated. It is between the groups 100 to 109 and 110 to 119 that the break occurs between gains and losses. At this point the difference between the two groups is statistically significant. Losses begin at 110 I.Q. and increase in magnitude until the 140 I.Q. level is reached, where the mean loss is 17 points. No child who was 140 or over on initial examination gained; all lost.

The next problem was to find whether the education, intelligence, or occupational level of the true parents or the foster parents seemed to be related to the changes in I.Q. between tests. A homogeneous group of 86 children who had been under three and one-half years of age on first test and had changed more than five points between tests was selected. Of these 23 had gained more than 6 points, 28 had lost 6 to 15 points, and 35 had lost more than 16 points between tests. The average occupational classification of the true fathers and the foster fathers was computed and it was found that there was no statistically significant difference between the fathers of those children who lost and those who gained.

Similarly the average grade attained by the true and foster parents of the children in the three groups was found. The results were inconclusive. Both the foster and the true parents of those who gained had gone farther in school than those who lost 6 to 15 points. However, there was no reliable difference between those who gained and those who lost more than 16 points in I.Q. It was concluded therefore that knowledge of the true or foster parents' education or occupation did not assist in predicting gains or losses in I.Q. between tests.

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CHAPTER XVII

MENTAL AND PHYSICAL TRAITS OF A THOUSAND GIFTED CHILDREN*

LEWIS M. TERMAN†

History and Description of the Investigation

This research may be said to have had its beginning during the years of the writer's graduate study, 1902 to 1905. He first became interested in the psychology of genius in a study of leadership which he made in 1902–1903 under the direction of Prof. E. H. Lindley, of Indiana University. While a student at Clark University he reviewed in 1903–1904 the medical-psychological literature on precocious children (7) and the following year carried out as a doctor's dissertation an experimental study of some of the mental processes of seven bright and seven dull boys (8).

However slight the positive contribution of these studies, they at least introduced their author to the literature on the psychology of genius and gave a keen realization of the fact that the field was a promising one for experimental investigation. When in 1910 it became possible for the writer to return to the problem, the progress which Binet and others had made in the field of mentality testing had created an entirely new situation. For certain ages, at least, it was at last possible to determine with some degree of approximation the brightness of a given child, compared with that of unselected children of his own age.

The importance of Binet's work for later studies of intelligence can hardly be overestimated. It has not yet received and possibly may never receive from psychologists the appreciation which it deserves. Critical ability, unfortunately, is far more common than ability to create, and to the critical psychologist the imperfections and crudities of Binet's methods, both in their practical and in their theoretical aspects, have often been more evident than their remarkable originality.

This report deals with only the first stages of an investigation begun in 1921 which will be continued, with the same subjects, for many years. The task of the future will be the comparison of promise and performance. In the fulfillment of this task, new light will be thrown upon the prognostic significance of the test scores and of the other records which have been secured. When our cases have thus been "read backward," so to speak, it will be easier to read other cases forward; to predict and prescribe in the light of long-range knowledge. Another unlimited field for future research is in the genealogical study of the families represented in our gifted group.

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* From Terman, L. M., *et al.* Genetic studies of genius. Vol. I: Mental and physical traits of a thousand gifted children. Stanford University, Calif.: Stanford University Press, 1925. Pp. xv + 648. Adapted with permission of Stanford University Press.

† Assisted by Bird T. Baldwin, Edith Bronson, James C. DeVoss, Florence Fuller, Florence L. Goodenough, Truman Lee Kelly, Margaret Lima, Helen Marshall, Albert H. Moore, H. S. Raubenheimer, G. M. Ruch, Raymond L. Willoughby, Jennie B. Wyman, Dorothy H. Yates.

Increased knowledge of the origin and of the physical and mental traits of gifted children is not an end itself. When the sources of our intellectual talent have been determined, it is conceivable that means may be found which would increase the supply. When the physical, mental, and character traits of gifted children are better understood it will be possible to set about their education with better hopes of success. Educational experiments in this line are already being undertaken in the public schools in ever-increasing number, but these need to be supplemented by privately endowed undertakings which permit of greater freedom for experimentation. Surely, in a nation of a hundred million people there should be one or more schools of this kind; schools which would be unhampered in the selection of such pupils as the experiment called for, which would be free to follow without hindrance the lead of experimental evidence and financially in a position to allow for long-range planning. In the gifted child, nature has moved far back the usual limits of educability, but the realms thus thrown open to the educator are still *terra incognita.* It is time to move forward, explore, and consolidate.

Method and Results of the Search for Subjects

The purpose of the search was to locate subjects of a degree of brightness that would rate them well within the top 1 per cent of the school population. It was also desired to secure subjects who would be as fairly as possible representative of all gifted children of the degree of brightness set as a standard for selection. It is obvious that conclusions regarding the characteristics of gifted children in general will be valid only to the extent to which the latter requirement has been met. Too often physicians and psychologists, as well as laymen, have based their conclusions regarding the supposed abnormality of intellectual precocity on selected cases.

It was not considered feasible to attempt to locate the 1,000 brightest children in California, desirable as that would have been. Apart from the difficulties involved in equating the intellectual superiority of bright children of different ages, such a plan was entirely impracticable because of the size of the state (158,000 square miles) and the large school population (approximately 500,000 in grades 1 to 8). The cost of intelligence-test blanks for a half million children would alone have greatly exceeded the funds available for the entire research. The labor of giving and scoring the tests would probably have brought the cost of covering the entire state by this method to many times the amount of money available for the study. The limitation of the survey to the larger cities was therefore a matter of necessity. Traveling expenses were thus reduced to a minimum, as well as the time required for making the necessary arrangements with school officials. Such limitation, however, has undoubtedly affected the findings in various important ways, especially with respect to racial and social origin of the subjects, their scores on the various achievement tests, their grade advancement, their interests, their reading, and their recreational habits.

It was decided to use intelligence tests as the final criterion for inclusion of subjects in the main experimental group. However, since it was not feasible to test the entire school population even by an abbreviated test, it was necessary to use a preliminary sifting method to determine what children should be tested. The method adopted employed both teachers' ratings and age-grade status. In grades 3 to 8 the procedure involved three steps, as follows:

First Step.—From each class (composed ordinarily of 30 to 50 pupils) from one to five children (usually four) were selected for a mental test by the plan shown in the following blank.

Blank for the Selection of Gifted Children

To be filled out and returned to the principal's office before____________________
Name of teacher____________________Grade taught________________
School____________________________City____________________

To the regular class teacher: Below, write the names of from one to three pupils whom you regard as the most *intelligent* in your class or classes. If your class as a whole is distinctly superior to the average, three names may be given. If your class as a whole is distinctly inferior, give one name only. If your class is about average, give two names.

Do not base your judgment of intelligence upon school marks alone. Important qualities to consider are quickness and accuracy of mental grasp, originality, ability to reason clearly about new and difficult problems, breadth and accuracy of information, intellectual curiosity, command of language, common sense, and independence of judgment.

Take age into account. Of two pupils who seem to be about equally exceptional, but who differ one or more years in age, the younger is probably the more intelligent.

Do not underrate the bright child who is shy, or lacks industry, or stands low in deportment.

It is permissible to name *one* child of moderate *general ability*, provided such child is very exceptionally gifted in some *special* line, as in music, drawing, modeling, mechanical ingenuity, science, mathematics, composition, etc.

1. Most intelligent: Name____________Age (years and months)________Grade____
   Selected because of all-round intelligence or because of some particular talent? (Underline.)
   If because of particular talent, in what line or lines?____________________
   Is this child's ability "very extraordinary," "decidedly superior," or only "slightly superior"?
   ____
2. Next most intelligent: Name____________Age (years and months)________Grade____
   Selected because of all-round intelligence or because of special talent? (Underline.)
   If because of some special talent, in what line or lines?____________________
   Is No. 2 almost as exceptional as No. 1, or considerably less exceptional? (Underline.)
3. Third most intelligent: Name____________Age (years and months)________Grade____
   (Third name to be given only in exceptionally superior classes.)
   Selected because of all-round intelligence or because of special talent? (Underline.)
   If because of some special talent, in what line or lines?____________________
   Is No. 3 almost as exceptional as No. 2 or considerably less exceptional? (Underline.)
4. Below name the *youngest* pupil in each grade or half-grade represented in your room:
   Grade or half grade____Youngest pupil____________Age (years and months)________
   Grade or half grade____Youngest pupil____________Age (years and months)________
   Grade or half grade____Youngest pupil____________Age (years and months)________
   Grade or half grade____Youngest pupil____________Age (years and months)________
5. In case you taught in this building during the half-year preceding this, give the name of the brightest child in your class *then*____________________
   What grade is that child in now?____________

On the above blank each regular classroom teacher made her nominations. In general, about 6 or 8 per cent of the pupils in grades 3 to 8 were tested, but the proportion varied from school to school. In a few of the best schools as high as 20 per cent of the pupils enrolled were tested; in the poorest schools, as low as 2 per cent.

Second Step.—Next, the nominees from several classrooms, often those from an entire school building, were assembled in a group and given the National Intelligence Test Scale B, Form I. Those who ranked in the top 5 per cent of unselected children of their respective ages were retained for further study. This standard proved to be too high and was later lowered to the ninetieth percentile, *i.e.*, top 10 per cent, in the case of children who, judged by teachers' ratings or age-grade status, seemed to be promising cases. Occasionally the standard was lowered to the eighty-fifth or even eightieth percentile, especially in the case of children of ages seven and eight. A seven-year-old was found, of Binet I.Q. above 140, who rated only at the eighty-fifth percentile on the National B. By our failure to give a Binet test to all above the eightieth percentile on the National, a few cases were undoubtedly lost who would have earned an I.Q. of 140.

Third Step.—Pupils retained by Step 2 were next given an abbreviated Stanford-Binet test. Two abbreviations were used, one for children of foreign parentage, the other for children of nonforeign parents.

Pupils attaining an I.Q. of 130 or more on the abbreviated scale were given a complete examination.

The method of selection employed, although far from ideal, probably led to the discovery of at least 80 per cent and possibly 90 per cent of all the cases who could have qualified in the school population canvasses. One can only surmise how the undiscovered cases would have differed from our experimental group in sex proportion, mean intelligence, social origin, personal characteristics, etc. They would almost certainly have been found a little less accelerated in school. Some would be excessively shy, others lazy, and still others lacking in adaptability. On the whole, the average child of our group is perhaps slightly better adapted to school life than is the strictly average gifted child of the same degree of brightness. It is improbable, however, that the general character of our group would have been significantly different from what it was, had it included all the cases that were overlooked. For comparative purposes control groups of unselected children of equivalent age and sex were used in different parts of the study.

Composition of the Gifted Group*

Table 1 shows the distribution of the I.Q.'s of the main experimental group of 643 subjects by age and sex. It is seen that the largest numbers of cases are found in the age groups eight to twelve, inclusive, and that the mode is at ten. This is due for the most part to the fact that the search was carried out chiefly in grades 3 to 8. Many bright children of seven years or less have not yet reached the third grade, while many of the brightest twelve-year-olds and nearly all the brightest thirteen-year-olds are in high school.

It will be noted that 21 cases were included whose I.Q.'s are in the interval 135 to 139 and one who is in one interval 130 to 134. The large majority of these 21 cases are within a point or two of I.Q. 140. Some of them were included because of indications that the Binet score, due to the conditions of the examination, was lower than it should have been; several of them because they were sibs of children who had already qualified; and a few because of special interest which attached to their cases. The number of exceptions made is, of course, too small to affect appreciably the general character of the experimental group or to invalidate conclusions which are drawn with respect to the mental and physical traits of children of I.Q. 140 or higher.

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* Written with the assistance of Florence L. Goodenough.

Sex Ratio.—The boys are considerably more numerous than the girls, notwithstanding the precautions that were taken to avoid sex preference in the method of search. In the main experimental group there are 352 boys and 291 girls (54.7 per cent boys, 45.3 per cent girls), a ratio of 121.0 to 100.

Of 33 cases later added to the main experimental group, there were 11 boys and 22 girls. If we include these, the ratio becomes 363 boys to 313 girls, or 116.0 to 100.

It is well known that there is an excess of male births in the general population. The best standard with which to compare the sex ratio in the gifted group is the sex ratio in the prehigh-school population of the cities covered by the survey. This was found to be 104.5 boys to 100 girls. Our problem is, therefore, to explain the difference between this ratio and those found for the gifted groups.

Biased Selection.—It is possible that the method of selection may have favored the boys, although in view of the fact that nominations on the basis of estimated intelligence were in the vast majority of cases made by women teachers, one would hardly expect this to be the case. The nomination blanks filled out by the teachers were examined for evidence of sex preference. Examination was carried out for the blanks filled out by the teachers of children who qualified for the gifted group. It is especially important to know whether these particular teachers showed a large sex preference in their nominations.

TABLE 1.—DISTRIBUTION OF I.Q.'S OF MAIN GIFTED GROUP

Age	2–4		5		6		7		8		9		10		11		12		13		Total		Total both sexes
I.Q.	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	
200	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	...	1	1
195																							
190	..	..	..	..	..	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..	...	2	2
185	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	1	1	2
180	..	..	1	..	..	..	..	..	1	1	..	..	4	1	2	..	..	..	..	..	8	2	10
175	..	..	..	..	..	..	..	..	..	3	1	..	1	..	..	2	..	..	..	..	2	6	8
170	..	..	..	..	..	..	2	1	3	1	2	2	2	3	..	2	2	..	..	..	11	9	20
165	..	..	..	..	..	2	..	..	3	2	2	..	8	1	4	4	..	1	..	..	17	10	27
160	..	..	1	..	..	1	3	..	3	4	4	2	7	6	8	2	..	2	..	..	26	17	43
155	..	1	..	..	3	1	1	1	3	5	6	7	7	5	3	9	6	5	..	1	29	35	64
150	2	..	1	2	3	4	5	1	11	3	16	6	17	11	17	11	7	10	6	1	85	49	134
145	2	..	5	2	2	1	7	8	9	9	11	8	10	16	12	11	11	13	7	6	76	74	150
140	2	3	2	3	7	9	7	8	11	12	16	14	19	9	12	16	9	6	..	5	85	75	160
135	2	1	1	..	1	1	1	..	..	2	3	1	2	1	1	2	1	1	..	..	12	9	21
130–134	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	...	1	1
Total.......	8	6	11	7	16	20	26	20	44	42	61	42	77	54	60	49	36	38	13	13	352	291	643

Of the original 643 cases (352 boys and 291 girls), 257 boys and 190 girls had been located as a result of nominations. The others were discovered in various ways, as explained elsewhere. The figures 257 and 190 give a ratio of 135.3 boys to 100 girls. The blanks on which these children were nominated contained nominations of 1,010 boys and 920 girls. The figures 1,010 and 920 are in the ratio of 109.7 boys to 100 girls. Omitting those qualifying, the ratio is 103.7 boys to 100 girls, which is almost exactly the same as the ratio for the entire school population in the cities covered. One could hardly conclude that the excess of boys in our group is due to the bias of teachers in making nominations. Even a large excess of boys nominated would not be proof of bias. The fact that the sex ratio of nominations on these blanks was 109.7 boys to 100 girls, whereas the sex ratio of those qualifying from these same nominations was 135.3 boys to 100 girls, would seem to free the teachers of the suspicion of bias.

There remains the question whether the Stanford-Binet test, which was relied upon for the final selection, is more favorable to boys than to girls. It is not possible here to review the numerous investigations that have been reported on this point in the literature of mental tests, nor is it necessary. The results have shown fairly consistently that, age for age and grade for grade, girls do fully as well on this test as boys.

Private schools, of which there are a considerable number in the cities canvassed, were not included in the survey. It is, of course, possible that such schools enrolled more gifted girls than gifted boys. We consider this unlikely, but the facts are not available.

Sex Ratio in Families of Gifted.—At the time the material on sex ratio was tabulated, data were available for 502 of the total 578 families which produced the main gifted group of 643 children. These 502 families yielded 317 gifted boys and 274 gifted girls, a ratio of 115.7 to 100. The total number of children in the same families was 655 boys to 548 girls, giving a ratio of 119.5 to 100. The ratio among the sibs of the gifted was 123.35 to 100,* which is appreciably higher than for the gifted themselves. It appears, therefore, that the factor which operates to give an excess of boys among the gifted affects no less strongly the sibs of the gifted. It has been suggested that superior vigor or vitality of parents favors maleness of offspring, and that this factor might at the same time exert a favorable influence upon the nervous structure and mental development of the offspring.

Sex Difference in Variability.—The most common explanation of findings such as we are here concerned with is that the human male is more variable than the female. However, the mental-test data bearing on sex variability are so inconsistent that it would be hard to say which way the weight of evidence inclines.

Racial and Social Origin†

Racial Origin.—The chief data on racial origin consist of replies by the child's parents to the following question asked in the Home Blank regarding each of the child's grandparents: What was the father's father's descent (for example, English and Scotch, German, Dutch and French, Russian Jewish, etc.)?

The question was answered for 85 per cent of the grandparents of those for whom the Home Blanks had been returned at the time tabulations were made. In tabulating the replies, a credit of two points was allowed for each grandparent, or one point for each great-grandparent, making a total of eight points for each child. The points were then totaled by nationality or race for each grandparent and reduced to per cents as shown in Table 2.

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* Not calculated by simple omission of the gifted themselves. To do this would introduce a statistical error, since it would mean giving least weight to those families producing most gifted children. The method followed was that of counting the siblings of each gifted child regardless of the number of gifted produced by the family. This involves duplications in the case of those families producing more than one gifted child and means weighting the sex ratio in each family in proportion to the number of gifted children produced by it.

† Written with the assistance of Florence L. Goodenough.

TABLE 2.—RACIAL ORIGIN OF MAIN GIFTED GROUP
(Per cent of grandparents of each racial or nationality group)

Racial stock	Per cent of total	Racial stock	Per cent of total
English	30.7	Austrian	1.3
German	15.7	Norwegian	0.9
Scotch	11.3	Danish	0.9
Irish	9.0	Japanese	0.6
French	5.7	Swiss	0.6
Russian Jewish	3.8	Bohemian	0.3
German Jewish	1.8	Russian	0.3
Polish Jewish	0.8	Hungarian	0.3
Rumanian Jewish	0.2	Rumanian	0.3
French Jewish	0.2	Flemish	0.3
Lithuanian Jewish	0.1	Armenian	0.3
Austrian Jewish	0.1	Portuguese	0.3
Bohemian Jewish	0.1	Alsatian	0.3
Jewish, not classified	3.4	Negro	0.3
Total Jewish	10.5	Indian	0.1
Scotch-Irish	2.8	Mexican	0.1
Swedish	2.5	Syrian	0.1
Italian	1.4	Icelandic	0.1
Welsh	1.4		

It is unfortunate that no very reliable data on the relative frequency of the different racial stocks represented in the cities covered by the main survey are available. However, even without such comparative figures certain items in Table 2 stand out as significant. The percentage of Scotch is very high, as is also that of the Jewish groups, especially the Russian Jews. The English stock heads the list, but this is also probably true in the general population. The percentage of Latin blood is very low.

The proportion of Jewish blood, as it is reported, is 10.5 per cent of the total. The actual amount is probably greater than this, as there is reason to believe that the presence of Jewish blood has in some cases been concealed. According to the estimates of a number of prominent Jewish social workers, the proportion of Jews in the total population of the three main cities covered (Los Angeles, San Francisco, and Oakland) is approximately 5 per cent. According to this estimate, the amount of Jewish blood in our group is about twice the expected.

Negroes represent 2 per cent of the total of the combined population of Los Angeles, San Francisco, Oakland, Alameda, and Berkeley, and furnish 0.3 per cent of our gifted group (two cases). As these cases are both part white (exact proportion of white blood is not known), they account for less than 0.3 per cent of the ancestral units in Table 2.

In regard to the absence of Chinese, it should be noted that the Oriental schools which the Chinese children attended were not canvassed.

The total population of Latin extraction in the cities covered is not known, but it is certainly very large in comparison with the number of Latin children in our group.

Occupation of Fathers.—In the Home Blank spaces were provided for reporting "father's main occupation at successive ages," including age when each occupation that had been followed was begun and the number of years it was followed. The replies were sufficiently definite for 560 fathers in the main group to permit of classification of occupation.

Regrouping according to Taussig's five-grade classifications, we have the following:

PERCENTAGE DISTRIBUTION		
Professional		31.4
Semiprofessional and business		50.0
a. Higher group	31.2	
b. Lower group	18.8	
Skilled labor		11.8
Semiskilled to slightly skilled		6.6
Common labor		0.13

The above data are in line with the findings of others on the social origin of superior ability.

There is one respect in which the contribution of the present study is unique. Earlier investigations had proved nothing more than that the upper social strata are more productive of men and women who have succeeded in achieving eminence. It has often been argued that this superiority in achievement should be credited for the most part to the larger opportunity for achievement enjoyed by members of the favored classes. *Our data show that individuals of the various social classes present these same differences in early childhood, a fact which strongly suggests that the causal factor lies in original endowment rather than in environmental influences.*

Divorce and Separation of Parents. In the case of 5.24 per cent of families of the gifted, the parents are divorced, and in the case of 1.9 per cent they are separated. These figures are lower than those for fruitful marriages in the general population of California.

Education of Parents.—The data for parents consist of reports on the following item in the Home Blank:

> Draw a line under the highest school grade reached: Father: 1, 2, 3, 4, 5, 6, 7, 8; High School 1, 2, 3, 4; College 1, 2, 3, 4; Post Grad. Other kinds of schools attended by father, and length of time. . . .

The question was asked separately for mothers. For each grandparent the question asked was simply: Extent of education (school grade reached) . . . .

The figures may be too low, owing to a natural tendency to interpret the term "grade reached" as meaning grade completed.

The central tendencies and variabilities for the data are as follows:

	Amount of schooling in grades		
	Median	Mean	S.D.
Fathers of gifted boys	12.2	12.6	3.99
Fathers of gifted girls	11.3	11.8	3.74
Mothers of gifted boys	12.2	11.9	3.10
Mothers of gifted girls	12.2	11.9	3.36
All parents	12.1	11.8	3.46
All grandfathers	8.9	10.8	4.05
All grandmothers	8.8	9.7	2.84
All grandparents	8.9	10.0	3.42

The median amount of schooling for the native-born white draft of the United States army in the first World War, as given in the official report, was 6.9, or not quite through the seventh grade (5). For the same group the proportion of college graduates was approximately 1 per cent. The figures reported for the army agree closely with those of Thorndike based upon school reports (9). In neither case, however, are the data exactly comparable with those for parents of our gifted. These should be compared with adults in the generality of corresponding age. The mean age of the United States army draft of 1917 and 1918 was probably 15 years lower than that of the parents of our gifted, and, as the mean amount of schooling in the general population has risen considerably in recent years, the showing made by our parents is even better than it at first appears.

Intellectually Superior Relatives*

It has thus far not been possible to undertake an extended study of the heredity of our gifted children, but the facts presented in the preceding section indicate that a majority have sprung from families of distinctly better than average ability. The purpose of this section is to summarize such information as we have been able to secure with reference to the frequency of gifted relatives.

The Home Information Blank was filled out for 94 per cent of the children in our main group, but not always with the completeness that could have been desired.

Home visits by the field assistants and correspondence have supplemented considerably the data supplied in the Home Blank, but our information on heredity is still extremely fragmentary.

Siblings in the Main Group.—Considering the highly selected nature of our group, the likelihood of a family furnishing two subjects by mere chance is very remote. Not more than 1 child in 200 in the general school population is capable of satisfying the standard. The families represented in our group probably have on an average not more than two children attending the public schools. Reckoning the number in school as two, a given family would have one chance in a hundred of furnishing one subject. The likelihood of one family furnishing two subjects by chance alone would be $\frac{1}{100} \times \frac{1}{100}$, or 1 in 10,000. Accordingly, by chance alone we should not have expected a single family to have yielded two subjects. Actually, 71 furnished two, and 80 two or more. Taking our estimate that 20 families would have done so even if no special search had been carried on among sibs, this would be 346 times the number which chance alone would have given. The record of 71 families with two children is, on the same basis of reckoning, 1,228 times as high as chance would give. Insofar as gifted sibs have been missed, this record is lower than it deserves to be. On the other hand, it is possible that teachers in nominating children for the tests may have been inclined to favor the sib of a child who had made an exceptional school record. However, even if we make considerable allowance for this possibility, the showing made by these 578 families must still be considered remarkable.

Relatives in Who's Who.—Twelve of the 643 are known to have a parent or grandparent in *Who's Who* (1921–1922). These 12 children represent 8 families, which gives an average of 1.5 gifted children for such families. There are three fathers, two mothers, and four grandfathers in *Who's Who.* Two sibs have mother and grandfather thus distinguished. Each of the two mothers has two children in the group (all the living offspring). Of the three fathers, one has two children in the group. All the children of these three fathers who have been tested have qualified.

The above numbers are almost certainly too small, as it has not been possible to check all parents and grandparents against the numerous editions of *Who's Who.* It is also necessary to take into account the fact that half or more of these parents are still below the average age of first inclusion in *Who's Who.* Other parents of the group will doubtless yet attain this degree of distinction.

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* Written with the assistance of Florence L. Goodenough.

That 3 of the 578 fathers and 2 of the 578 mothers in our main group should have attained this distinction by mid-life is many times the number chance would give. Brimhall finds the average age of first inclusion in *Who's Who* (Vol. VI) to be 49.9 years (2). The average of our 578 fathers is about forty-one years and that of our 578 mothers about thirty-seven years. Brimhall estimates the chances of a man of the generality getting into *Who's Who* as 1 in 823.5. For men of the average age of the fathers of our gifted children the chances are probably less than 1 in 2,000. The actual number is 3 out of 578, which is about 19 times the number chance would give.

Vital Statistics

Size of Families.—There are only 91 completed families in our group, if we count as completed a family in which the mother is forty-five years old or older. These 91 mothers reported to the medical examiners a total of 353 pregnancies, two of which were of twins. The number of children which might have resulted was therefore 355. Forty-six miscarriages and 45 deaths were reported. The 309 births exclusive of miscarriages include 165 boys and 144 girls, giving a sex ratio of 114.58 to 100.

In the same 91 completed families information was available regarding the size of the family from which 85 of the fathers and 88 of the mothers had come. The correlation between number of children in the present generation and the number in each of the parents' families was as follows:

Immediate family vs. father's family, $r = .36 \pm .06$

Immediate family vs. mother's family, $r = .18 \pm .07$

The 91 families were distributed as follows with respect to the number of children in the present generation:

Number of children	1	2	3	4	5	6	7	8	9	10	11
Number of families	19	22	16	11	7	7	3	2	2	..	2

These data yielded an average number of children of 3.40 to the family. At first thought such an average might be taken to indicate that the California gifted families are probably in general maintaining their numbers. Further consideration, however, shows that the average of 3.40 is subject to three corrections.

First Correction.—There is a selection of families "caught" in our survey, owing to the fact that a large family has a better chance of coming into our group than a small family. To take a simple hypothetical case, if half the marriages of a population produced two children and the other half of the marriages produced four children, the average number of children per marriage, for the total population, is 3. However, since the four-child marriages taken together produce twice as many children as the two-child marriages, it comes about that any random sampling of the children in such a population would give us twice as many four-child families as it would give of two-child families. For example, if 10 two-child families were caught (20 children), the expected number of four-child families caught would be 20 (80 children). The sum of the children (100) divided by the number of marriages (30) gives the average number of children for the sampling as 3.33, which is to be compared with the average of 3.00 for the total population. Accordingly, any group of families located in the manner in which our gifted families were located will yield an average number of children which is spuriously high.

The fertility index of fertile marriages of this class of parents in California is not represented by 3.40 (the average number of children in the families caught), but by 2.18.

Second Correction.—It must be borne in mind that the index 2.18 holds only for fruitful marriages. Since marriages which were childless could not be included in our sampling, a further correction is necessary. Assuming the proportion of childless marriages to be the same as that reported by Cattell for the generality of marriages in America, *viz.*, 17 per cent, the 91 fruitful marriages indicate a total number of marriages of 110, and our fertility index of 2.18 is accordingly reduced to 1.80 (91 × 2.18 ÷ 110 = 1.80).

Third Correction.—The index 1.80 is for those individuals who marry and have children, but since a large proportion of the individuals of this class remain celibate, a third correction must be computed. In all probability this proportion is as high as 20 per cent. If we base our estimate upon this figure, our index of 1.80 is reduced to 1.44 (91 × 2.18 ÷ 138 = 1.44). Accordingly, if our data may be regarded as typical, it appears that a man or woman representing the stratum with which we are here concerned is producing on the average 0.72 child and that the gifted families of California are rapidly dying out.

That the situation in the present generation is eugenically less favorable than in the preceding generation is shown by a comparison of the figures above with the corresponding figures for the fathers' and mothers' families. Data were available with respect to the size of the father's family in 85 of the 91 cases, and with respect to the size of the mother's family in 88 cases. Carrying out the same computations for the parents' families as we have already made for the families of the present generation, but allowing for 10 per cent of celibacy instead of 20 per cent, since it is known that celibacy in the educated classes was formerly less frequent than at present, we have the significant results shown in Table 3.

If we base our comparison on the estimated number of children for all marriages in this stratum of the general population (Item 3, Table 3), the reduction in fertility is from an average of 3.25 in the parental generation to 1.80 in the present generation. This is a decrease of 45 per cent. When we take account of the increasing celibacy (Item 4, Table 3), the reduction is from 2.92 in the parental generation to 1.44 in the present generation. *Therefore, the fertility index for the stratum of the California population with which we are here concerned has decreased by* 50 *per cent in a single generation.*

TABLE 3.—FERTILITY INDEXES OF PRESENT AND PRECEDING GENERATIONS

	Families of children	Families of fathers	Families of mothers
1. Number of children of selected marriages	3.40	5.33	5.66
2. Estimated number for fruitful marriages in this stratum of population	2.18	3.44	4.37
3. Estimated number for all marriages in this stratum of population	1.80	2.87	3.63
4. Estimated number after correction for celibacy	1.44	2.59	3.26
5. Estimated number per individual	0.72	1.28	1.63

Mortality and Diseases of Parents and Grandparents.—The average age of the father at the birth of a gifted child was 33.63 years (S.D., 7.70); of mothers, 29.01 years (S.D., 5.64). These figures are slightly lower than those reported by Cattell for parents of American men of science. The number of deceased fathers reported is 42; of deceased mothers, 13. The causes of death are too scattered to be statistically significant. Forty fathers (8 per cent) and sixty-one mothers (12 per cent) have one or more chronic illnesses, many of which are of minor importance. This is probably less than would be found for adults of corresponding age in the general population. There is a record of tuberculosis in one or both parents of 5.4 per cent of the children.

The longevity of the grandfathers of the gifted subjects is at least 2.35 years, and probably more than that in amount, in excess of the expected.

Four parents (0.4 per cent), 16 grandparents and great-grandparents (0.3 per cent), and 37 other relatives were reported to the physicians as having had a record of insanity. Very few other cases of hereditary defect were reported.

Anthropometric Measurements*

In the spring of 1923 Dr. Terman invited the writer to cooperate in a comprehensive investigation of a group of intellectually gifted children whom he had selected in California. The problem assigned was to make an anthropometric study of the status of the physical growth of these children. The purpose was (*a*) to secure an accurate picture of the status of physical development of each of the gifted children through a series of selected physical measurements; (*b*) to make a comparison of their total and partial growth

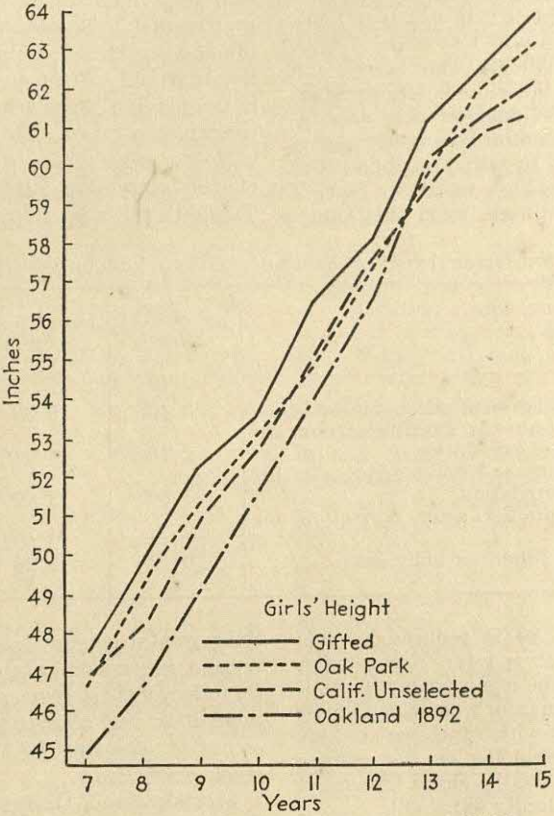

FIG. 1.—Height of gifted and other groups of girls.

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* Written by Bird T. Baldwin.

with that of other groups; (*c*) to determine the relationships of various physical traits measured; and (*d*) to analyze the correspondence of the physical status and mental status of this group of children.

The 594 children of the main experimental group which were measured included 312 boys and 282 girls. Thirty-seven careful anthropometric measurements were taken on each child, without clothing, making a total of 21,978 measurements on the 594 children.

Since the weight-height relationship of a child furnishes one of the best general criteria for its physical status, the average heights and weights for all the children included between the ages of seven and fifteen were first computed and the results compared with those of earlier writers on California children and on a few representative groups in other parts of the United States. The results given in Figs. 1 to 4 show at a glance that this group, measured by the group average, is physically superior in both height and weight for age, although several children are small and some are considerably underweight. The Oakland children measured by Barnes in 1892 are considerably inferior to this group, although they were heavier and taller than similar groups of children from Boston, Worcester, Toronto, St. Louis, and Milwaukee, whose records were displayed at the World's Fair in Chicago in 1893. The

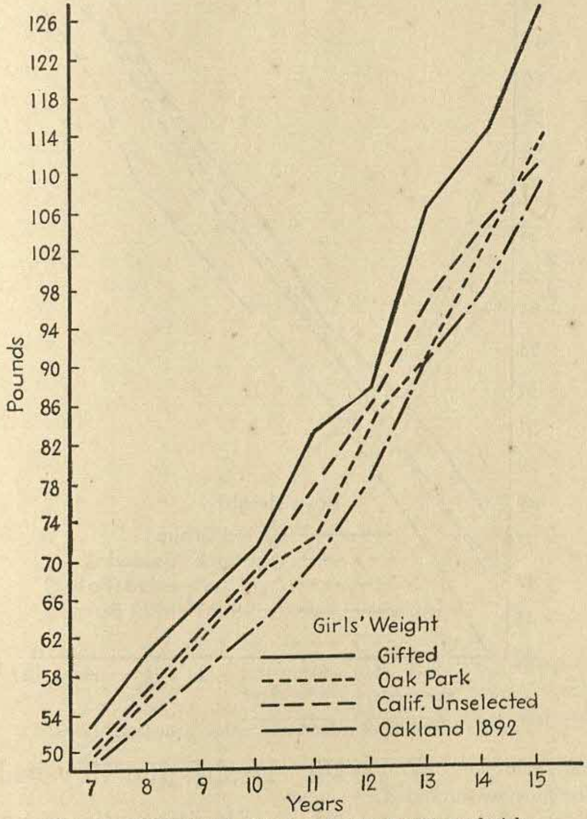

FIG. 2.—Weight of gifted and other groups of girls.

Oak Park group is from one of the most favored social sections of Chicago. Faber's study in 1923 was of a group of California children. The California gifted children excel them all in height and weight for all ages included.

These children also excel the children of a control group in Oak Park, Ill., in four selected physical traits, arm span, width of shoulders, width of hips, and grip.

When age is made constant for the entire group of children from two years to fifteen years of age by means of partial correlation, a small but probably significant positive correlation is found between mental age and height for boys and girls, but no correlation is found between mental age and other physical measurements.

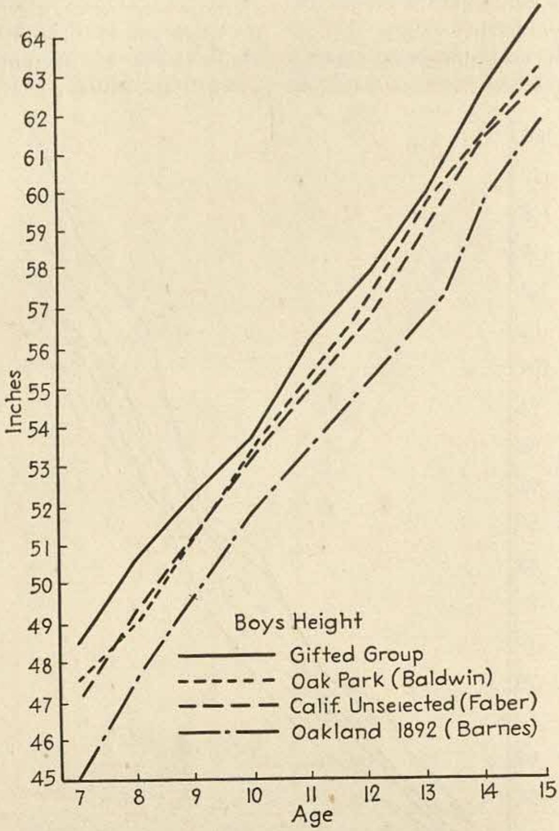

FIG. 3.—Height of gifted and other groups of boys.

Health and Physical History*

The data on this phase of the study are summarized in graphic form in Figs. 5 and 6.

School Attitudes, Achievement, and Progress

Extensive studies by means of questionnaires, ratings, and reports by pupils, teachers, and parents and tests of pupils provided extensive data upon the comparative school attitudes, achievement, and progress of gifted and control children. An abstract of the chief conclusions follows.

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* Prepared with the assistance of Florence L. Goodenough, Dr. Albert H. Moore, and Dr. Edith Bronson.

The average gifted child enters school (above the kindergarten) at 6¼ years; nearly half learned to read before starting school with little or no formal instruction. According to the usual standards, about 85 per cent of the gifted children are accelerated and not one is retarded. According to the testimony of the teachers, the average gifted child merits additional promotion to the extent of about two-thirds of a grade. Teachers' ratings of school work show the gifted children, as a rule, are doing work of superior quality in the grade in which they are located. The superiority of the gifted child of a given age (as shown by achievement tests) over unselected children of corresponding age is very great, amounting in some cases to from three to four times the S.D.'s of the unselected age group. This superiority holds for all the fields of accomplishment tested. In general, the average gifted child has mastered the subject matter of instruction to a point 40 per cent above his chronological age, although he has been held back to a grade location only 14 per cent beyond the norm for his chronological age. At a given age there is practically no correlation between educational accomplishment and the number of terms the gifted child has

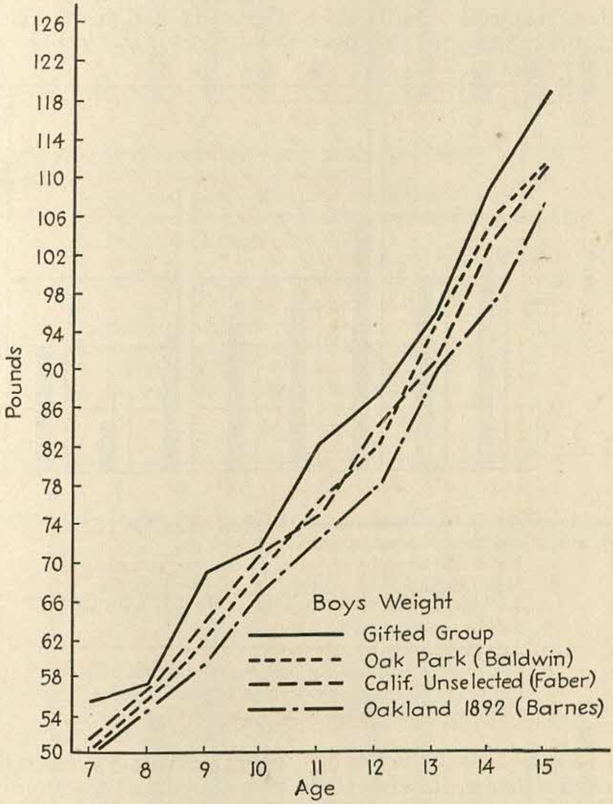

FIG. 4.—Weight of gifted and other groups of boys.

attended school. The causes of school success and of school failure lie deeper.

Only 1 per cent of the gifted are reported by parents as having a positive dislike for school. Liking for school is "very strong" with 54 per cent of the boys and 70 per cent of the girls. With certain exceptions, gifted children are more interested than unselected children in school subjects which are abstract and less interested in the "practical" subjects. Their interest is relatively much stronger, for example, in such subjects as literature and dramatics and much weaker in penmanship, manual training, sewing, etc. Subjects that are positive both with gifted boys and with gifted girls are dramatics, literature, reading, history, games and sports, and physical training; subjects that are negative with both gifted groups are painting, grammar, penmanship, physiology, and hygiene.

Roughly 70 per cent of the parents say they have allowed the child to go his own pace in school, 20 per cent have encouraged rapid progress, and 10 per cent have held the child back.

The parents of 8 per cent report that they had never observed in their children any indications of superior general intelligence. For the others, the average age at which intellectual superiority was first noted was about three and a half years. The indications of superior intelligence most often noted were quick understanding, insatiable curiosity, extensive information, retentive memory, early speech, unusual vocabulary, etc.

Very few of the parents have carried out any systematic scheme of child training, but a majority have encouraged the child by answering his questions and taking an interest in the things which concerned him. Although the home environment of the gifted children has been, on the whole, above the average, nothing has been found to warrant the belief that the superior intellectual attainments of our gifted

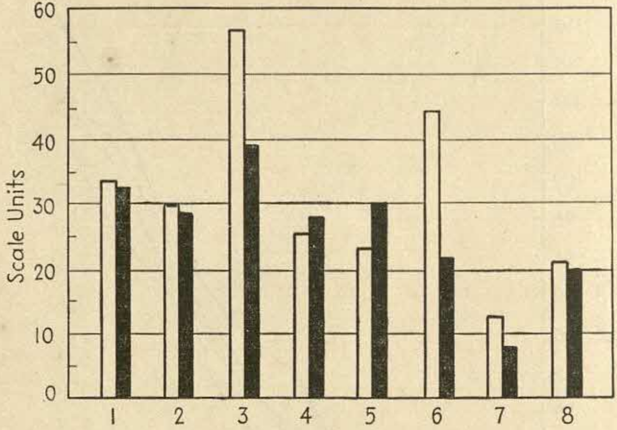

Fig. 5.—Growth and development of gifted and unselected children. Unshaded, gifted children; shaded, unselected children.

1. Mean birthweight of boys, in quarter pounds
2. Mean birthweight of girls, in quarter pounds
3. Per cent breast fed 8 months or longer, both sexes
4. Age of walking, in half months, boys
5. Age of talking, in half months, boys
6. Per cent of 12-year old boys having pubic hair
7. Per cent of girls menstruating before 12 years
8. Daily sleep, in half hours, both sexes

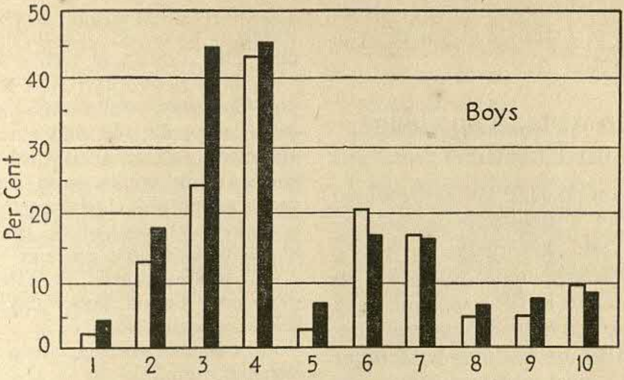

FIG. 6.—Physical defects in gifted and control groups. Unshaded, gifted group; shaded, control group.

1. Per cent having frequent headaches
2. Per cent with symptoms of general weakness
3. Per cent of mouth breathers
4. Per cent who have colds occasionally or often
5. Per cent with poor or very poor hearing
6. Per cent with vision somewhat defective or poor
7. Per cent nervous
8. Per cent with speech defects
9. Per cent who are exceptionally timid
10. Per cent who show tendency to worry

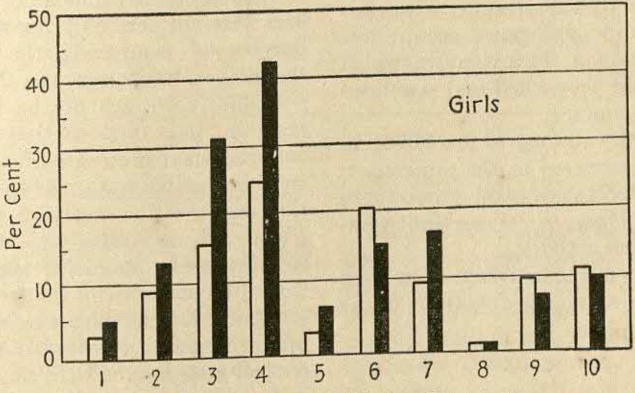

FIG. 6*A*.—Physical defects in gifted and control groups. Unshaded gifted group; shaded, control group.

1. Per cent having frequent headaches
2. Per cent with symptoms of general weakness
3. Per cent of mouth breathers
4. Per cent who have colds occasionally or often
5. Per cent with poor or very poor hearing
6. Per cent with vision somewhat defective or poor
7. Per cent nervous
8. Per cent with speech defects
9. Per cent who are exceptionally timid
10. Per cent who show tendency to worry

group are in any considerable degree the product of artificial stimulation of forced culture.

Play Interests, Knowledge, and Practice*

Our data on play fall into two groups: (*a*) results of a questionnaire test of interest in and knowledge of plays, games, and amusements; (*b*) replies to certain questions in the supplementary Home Blank and School Blank relating to play and to associations with other children. On most points comparative data were secured for a control group, as it was one of the main purposes of this section of the study to determine to what extent and in what respects the play life of gifted children deviates from the normal. The belief is generally entertained that the deviation is considerable, although no statistical evidence bearing on the question has ever been presented.

A preference index was computed for each of 90 activities, separately for each age, sex, and intelligence group; this was based upon the extent to which children said they liked and practiced particular games.

Masculinity Ratings of the Children. The sex differences in the preferences expressed by the control group were made the basis of "masculinity indexes" of the activities.

The order of the activities from most to least masculine is found to be as follows:

Tools.
Shooting.
Kites, bicycle, marbles, wrestling, boxing, football.
Tops, machinery, baseball.
Fishing.
Bow and arrow, skiing, tug of war, soccer.
Stilts, garden work, basketball, pool.
Hoops, swimming, rowing, hunting, snap the whip, shinny, racing and jumping.
Coasting, hiking, riding, duck on rock, leapfrog, bowling, handball, backgammon, checkers, chess, billiards.
(*Line of neutrality.*) Red Rover, pompom-pullaway, follow-the-leader, ante over, roly-poly, fox and geese, croquet, volleyball, dominoes, Crokinole, parcheesi, tiddly winks, snap, cards, history cards, geography cards, word building.
Jackstraws, post office, blackman, fox and hounds, tennis, authors.
Tag, hide-and-seek, puss in the corner, dare-base, Simon says, playing church, solving puzzles.
Jackstones, skating, drop the handkerchief, blindfold.
Ring-around-a-rosy, London Bridge, farmer in the dell, in and out the window, cat and mouse, jumping rope, guessing games, charades.
Dancing, sewing, playing store.
Knitting or crocheting.
Playing school.
Cooking, playing house.
Hopscotch.
Dressing up.
Dolls.

The masculinity indexes of the activities were not derived primarily for the purpose of comparing the activities themselves, but to serve as the basis of masculinity ratings of the individual children. It is obvious that when the activities have been rated for masculinity it is possible so to rate the child, on the basis of the activity preference which he expresses. A masculinity rating was computed for each child of the gifted and control groups.

Figure 7 gives the age curves for mean masculinity ratings of gifted and control groups by sex. In the establishment of the masculinity index, 13 was the value arbitrarily assigned to the game of neutral masculinity, with a range of from 1 to 25. This fact must be kept in mind in the interpretation of Fig. 7.

A comparison of the curve for gifted boys with that for control boys indicates the normal masculinity of the bright boy. The mean masculinity index for gifted boys is definitely higher than that of control boys at each age until thirteen, where it is practically the same as for the control boys. In the case of gifted girls the curve is somewhat irregular, but its general tendency is to run as high as that for the control girls. One striking fact about the curves of mean masculinity ratings of the control girls is the noticeable falling off in masculinity which occurs after the age of fourteen. The gifted girls show a slight tendency in this direction after age twelve.

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* Written with the assistance of Helen Marshall and Florence L. Goodenough.

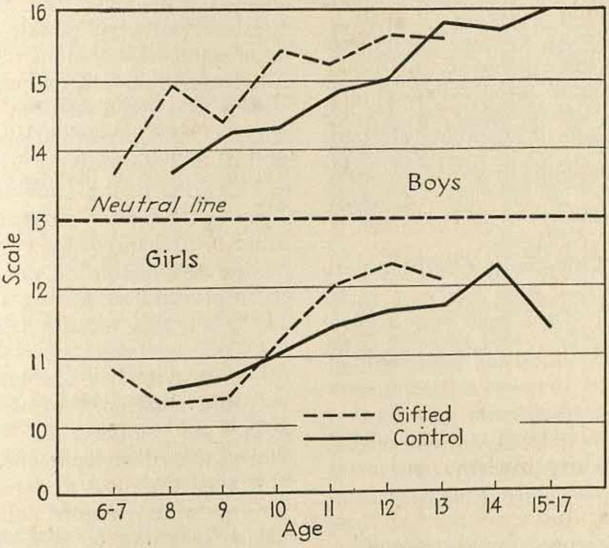

FIG. 7.—Mean masculinity ratings by age, gifted and control groups.

Maturity, Sociability, and Activity Ratings.—"Maturity ratings" of the children were derived, based on the maturity indexes possessed by the activities for which they had expressed preference. These ratings are constantly higher for gifted than for control children. This means that, in general, gifted children tend to prefer activities which, among control children, show *increasing* rather than *decreasing* popularity for the ages eight to fourteen.

A "sociability rating" was derived for each child, based on the proportion of preferences which fell to social and competitive games. This tended to run somewhat lower for gifted than for control children.

In the same way an "activity rating" was derived for each child, based on the proportion of preferences which fell to the quiet activities. These ratings were lower for girls than for boys and lower for the gifted than for the control group.

Play Information and Practice.—The tests of information show that gifted children, age for age, possess enormously more information about plays, games, and amusements than do unselected children. In fact, their superiority in play information is almost as marked as their superiority in the Stanford Achievement Tests. It is of course unsafe to draw any inferences regarding play habits from data on play knowledge, but it is interesting to know that whatever the play habits of the gifted may be, such children are at any rate not lacking in play information.

The gifted children play alone slightly more than do the control. However, the average gifted boy spends about 2¾ hr. a day with other children (out of school), and the gifted girl about 2¼ hr. Gifted children, oftener than control, prefer playmates who are older than themselves.

The gifted show much less sex preference than do control children in choice of playmates, and girls show far less sex preference than do boys.

The gifted child's companionship is sought in school to about the same extent as that of the control child, although the gifted child is usually considerably younger than his classmates.

There is little difference in the extent to which gifted and control children are teased by others or cry when they cannot have their own way. However, somewhat more gifted than control are said to be regarded by other children as "queer" or "different."

The play interests of gifted boys are somewhat more often said not to be normal than is the case with control boys. The reverse, however, holds for the girls.

Tests and Ratings of Interests and Personality and Character Traits

The following is an abstract of conclusions from extended studies

The gifted group give evidence of having stronger intellectual and social interests than unselected children; with respect to activity interests, gifted and control groups do not differ materially.

On the "character" tests the gifted group are significantly superior at all ages. The gifted child of nine has reached a level of character development corresponding roughly to that of unselected children of fourteen years.

Ratings by teachers and parents were found to agree strikingly that the gifted excel the unselected children in intellectual, volitional, emotional, moral, physical, and social traits. Mechanical ingenuity is the only trait on which the control group is rated higher than the gifted group.

The Promise of Youth*

The first part of these studies was devoted chiefly to the mental and physical traits of gifted children as these were evidenced in the results of tests, measurements, and observational reports at a given stage in their development. The investigations there described may accordingly be thought of as belonging to the cross-section type. They had for their purpose to give as concrete and quantitatively definite a picture as possible of the measurable traits of children having I.Q.'s above 140. How this picture might change with the passing of years was left for the most part to future determination.

Gifted children, like all other children, are subject to innumerable vicissitudes of environmental influence. Not even the most extreme of hereditarians would accord only zero or negligible value to the sum total of such influences. It is possible, moreover, that many of the traits which are to be accredited largely to original endowment are of the delayed type, which become manifest only after a given stage of development has been attained. If this should be true, alterations in the picture would sometimes occur regardless of the effects of environment. It is clear, therefore, that cross-section studies must be supplemented by studies of the longitudinal type if we are ever to learn the true facts regarding the development of an individual child.

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* From Burks, Barbara S., Dortha W. Jensen, and Lewis M. Terman. Genetic studies of genius. Vol. III: The promise of youth; Follow-up studies of a thousand gifted children. Stanford University, Calif.: Stanford University Press, 1930. Pp. xiv + 508. Assisted by Alice M. Leahy, Helen Marshall, Melita Oden.

The length of the interval between the main search for subjects in 1921–1922 and the follow-up investigation of 1927–1928 was in several important respects favorable. In the first place, it was great enough to make the comparisons between earlier and later findings significant and interesting. An interval of half the length, *e.g.*, would have brought out the trends of development much less clearly. On the other hand, a much longer interval than 6 years would have rendered all the earlier tests unsuitable for repetition and would have made impossible many of the quantitative comparisons which we considered extremely desirable.

The new study was planned toward the accomplishment of two purposes: (*a*) to serve as a check upon the correctness of the conclusions presented earlier; (*b*) by obtaining various kinds of data not obtained in the earlier investigations, to help to complete the picture of the typical gifted youth.

In regard to the first of these purposes, it has not seemed necessary to check elaborately the raw factual data. Of the substantial correctness of those data there can be little doubt. There is every reason to believe that any group of subjects selected in the same way and studied by the same or similar methods will show essentially the same tendencies to deviation from children of the generality that we have found.

In regard to conclusions based upon or growing out of factual findings of the kind just mentioned, the situation is different. Here there is endless need for additional evidence. We do not yet know to what extent the superior achievement of relatives is indicative that the gifted subject comes of biologically superior stock. We do not know how much the I.Q. and school achievement fluctuates during the period of mental development. We do not know whether such unevenness of ability as is found tends to increase or to decrease with age. We do not know whether age brings improvement or deterioration with respect to personality traits. We know all too little about the resemblances and differences between our gifted group and those individuals who in mature life achieve eminence of a degree that ranks them popularly in the class of geniuses. We know still less about the type of education that is best for gifted children.

It will be a long time before we shall be able to give a final answer to all these questions. On some of them we believe that a little light will be shed by continued study of the same gifted group, and it is this conviction which is responsible for the investigation here reported.

Retests of Intelligence

To some readers these data may hold more interest than those summarized in any other section. They are concerned with a problem of widespread interest and significance: Do intellectually superior children become intellectually superior adults? Opinions have varied from "always" and "usually" to "seldom" and "never."

Stanford-Binet Retests.—For all the accessible children of our group of ages up to and including thirteen years, no months, our follow-up program included a Stanford-Binet test. As the mean age of the regular group approximately 6 years before was nine years and eleven months, and as only 68 cases were then under seven years of age, the number of "regulars" eligible for a Stanford-Binet retest in 1927–1928 was not large. To augment the numbers slightly, we are summarizing also in this section the retest results for 16 "outside"* Binet cases. Outside Binet cases are included here only if the children had been first tested in 1921–

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* A group for which considerable data were collected in 1921–1922 in addition to the main experimental group.

1922, for we wished to keep the time interval approximately constant between tests and retests.

A comparison of mean I.Q.'s in 1921–1922 and in 1927–1928 is given in Table 4. Here it is seen that the average drop in I.Q. for both sexes combined is 9 points. It is noteworthy that the drop is nearly five times as large for girls as for boys, the girls averaging 13 points lower than they did at the time of the original tests, and the boys only 3 points lower. The difference, 10 points, between the average decrease for the boys and the girls, has a standard error of approximately 3 points.

TABLE 4.—COMPARISON OF STANFORD-BINET I.Q.'S, 1921–1922, 1927–1928

	Boys			Girls			All		
	Mean	S.D.	*N*	Mean	S.D.	*N*	Mean	S.D.	*N*
1921–1922 Regulars	147	8.4	27	150	11.8	27	148	10.4	54
1927–1928 Regulars	144	14.5	27	133	14.0	27	139	15.1	54
Difference	3	−6.1	. .	17	−2.2	. .	9	−4.7	
1921–1922 Regulars and outside	146	8.2	38	149	11.2	35	148	10.0	73
1927–1928 Regulars and outside	143	17.8	38	136	15.4	35	140	17.0	73

Of greater significance than the average tendencies are the facts regarding the total distribution of I.Q. changes. While there are no very pronounced sex differences with respect to the average amount of change in I.Q., when direction of change is disregarded, the girls greatly outnumber the boys in I.Q. decreases, and the boys exceed the girls in number of I.Q. gains. The tabulation shows that 5 of the 27 regular boys and 8 of the total 38 boys lost as much as 15 points each in I.Q.; 5 of the regular boys and 7 of the total of 38 boys gained as much as 15 points each; 14 of the 26 regular girls and 16 of the entire 34 girls lost as much as 15 points each; none of the regular girls and only 1 of the entire 34 girls gained as much as 15 points each. There were several cases of extreme change, two regular boys and four regular girls each dropping 25 points or more.

Possible Causes of I.Q. Changes

We may now inquire whether there are any conditions of environment, personality, health, or race that are peculiar to the group whose I.Q.'s show decreases and which might therefore account for the measured I.Q. changes. Our sources of information are the original and follow-up home and school blanks, the field visitors' home interviews, and the test data obtained during the follow-up. In the following treatment only the cases that showed marked decreases in Stanford-Binet I.Q. have been considered, because there are too few cases showing marked increases to make statistical treatment of them profitable and because the significance of changes estimated from the follow-up Terman Group Test scores is not so clear-cut.

Health.—Data provided by the follow-up home and school blanks regarding the health of our subjects since 1922 are compared with corresponding data for the entire group of regulars. We find no evidence that the "lowered I.Q." cases have more than their share of poor health; in fact, the figures, if taken at their face value, are slightly more favorable for the "lowered I.Q." subjects, though the number of cases is not sufficient to establish this reliably.

Race.—The values in Table 5 represent the percentage of grandparents with the descent in question. In connection with Table 5 it should be borne in mind that, since the number of cases in the "lowered I.Q." group is relatively small (about 30), it is beyond the realm of probability that these cases should represent all the nationalities represented by the entire gifted group; it should also be remembered that, when a child does occur whose descent is from one of the nationalities to which few of the gifted group belong, the percentage from that nationality is greatly altered because of the small total number of cases. If we lump certain nationalities occurring frequently in the regular group which have been shown in many previous studies to be fairly comparable with respect to mental level, we obtain a more reliable result. The outcome of such grouping is shown in the last item of Table 5. It is seen that there are no significant differences in the racial extraction of the entire gifted group and that of the "lowered I.Q." cases.

Table 5.—Cases Whose I.Q.'s Decreased Compared with All Regulars with Regard to Racial Extraction

Racial stock	Percentage of total	
	I.Q.'s decreased	All regulars
English	28.6	30.7
Scotch	14.3	11.3
German	12.7	15.7
Scotch-Irish	9.5	2.8
French	7.7	5.7
Jewish	6.9	10.5
Welsh	5.8	1.4
Danish	4.2	0.9
Spanish	4.2	0.3
Irish	2.4	9.0
Dutch	1.6	
Mexican	1.1	0.1
Icelandic	1.1	0.1
English, German, Scotch, Irish, Scotch-Irish, and Welsh	73.3	70.9

Environmental Factors.—To many readers the thought will occur, as it did to us, that the changes in I.Q. might be accounted for by environmental factors. But we fail, once more, to find anything of positive significance. There is a slight tendency for the "lowered I.Q." cases to come from better homes as measured by Barr occupational ratings; but the difference, 1.7 between the mean Barr rating of the "lowered I.Q." cases and the "constant I.Q." cases, has a standard error of 0.8 and is thus hardly significant. The environmental conditions, as rated by the field assistants, are rather well matched in the two groups. In neither of the two groups is there an appreciable incidence of "marked change in family circumstance."

Personality Traits.—We have summarized follow-up information regarding certain traits of personality and find no clear evidence for inferring that the children whose I.Q.'s dropped have poor balance or undesirable personality as compared with members of the entire gifted group. There is a relative excess in the former group of children showing signs of nervousness and of children whose companionship is especially sought which may have some slight diagnostic significance, though the number of cases is too small to establish the excess with certainty.

Mental Growth Rate.—We have found no reason for believing that conditions of environment, personality, health, or race have been responsible for I.Q. decreases that have occurred. We have not, of course, eliminated the possibility that obscure factors of environment, personality, or health may have been at work to bring about the observed changes; but if obvious factors of this sort have had no demonstrable effect, the presence of mysterious subterranean influences that are undermining our children's abilities seems at least to be improbable.

Two other possibilities suggest themselves. One is that the fluctuations in I.Q. may be accounted for by changes in the rate of mental growth that are congenital or at least quite normal in character. It is well known that there is a high correlation between physical stature in childhood and adulthood but that occasionally the adult's stature misses by a wide margin the value that would have been predicted in his childhood. Such deviations are not necessarily accounted for by pathological or traumatic conditions. Some children merely seem to grow by spurts and starts. The causes of the fluctuations in growth doubtless have physiological bases and may be closely tied up with endocrine secretions, but that is not saying that the physiological bases may not be congenital and normal. It is possible that an analogy exists in the mental domain. If no other theory can be made to account for the observed data, we feel that a normal-change-of-rate theory is reasonable and does no violence to established facts.

Nature of the Stanford-Binet Test.—Thus far our discussion has assumed that the Stanford-Binet scale measures the same trait or traits at all age levels with which we are concerned. This is not the same thing as positing Spearman's general factor of intelligence. For our present purpose it is irrelevant whether intelligence as measured by the Stanford-Binet test is composed simply of Spearman's g or of a large number of only partially contributing factors. It is important, however, to know whether or not the test is measuring very nearly the same factor or factors at all mental age levels. If the nature of the test should be such that at age six, for example, it measured a factor A and a factor B but at age twelve it measured factor A, a new factor C, and no factor B, and if, further, factors B and C were large enough to make significant contributions to the total scores, we might expect considerable fluctuation in I.Q. even though the true intellectual abilities of the subjects remained the same over the period of six years.

It was hoped that our follow-up data might afford a means of testing the hypothesis that changes in I.Q. are due to changes in the nature of the Stanford-Binet scale. One of the authors has devised a method of investigating such a hypothesis through a comparison of the correlation between scores of siblings tested at approximately the same age with that between scores of siblings tested at ages differing by a specified amount (3). It can readily be seen that if the scale at two levels of mental ability measured factors that were sufficiently disparate, there would be a more favorable chance for either inherited or acquired similarities between siblings to show up when both members of each pair were tested on the same level of the scale.

Adapting the method described in full in the reference cited, we have calculated the effect that a possible difference in the nature of the Stanford-Binet test at two different age levels might be expected to have upon sibling correlations. This effect is not large, though it corresponds to a reduction of the order of .48 to .40 or .50 to .43 in a sibling correlation based upon unselected subjects.

Our data do not preclude the possibility of change with age in the functions measured by the Stanford-Binet scale; but they give it no support.

Sex as Associated with Decrease in I.Q.—A final line of reasoning reverts to the sex differences, reported earlier in this section, on the follow-up retests. It will be recalled that the 27 regular boys retested on the Stanford-Binet gave an average decrease of only 3 points, while the 27 girls retested gave an average decrease of 17 points. In the regular group the number dropping by 15 points or more was nearly three times as great for girls as for boys. We cannot reconcile such a sex difference with a theory explaining I.Q. changes as due to a radical change in the nature of the test. If the *test* made the I.Q.'s of the girls decrease, why did it leave the mean of the boys within 3 points of their original mean? While it might be thought that the test is actually built out of materials that favor boys more than girls, quite regardless of their intelligence, we find this hypothesis impossible to reconcile with the fact that the average I.Q. of unselected girls is as high as the average I.Q. of unselected boys.

Conclusion with Respect to Cause of I.Q. Changes.—The only conclusion that we can see from the data at hand is that changes in ability found over a term of years in such a group as ours are due chiefly to change-of-rate factors inherent in the individuals and that such factors are correlated with sex. Whether their effect upon mental growth is permanent or temporary we have no way of knowing at present. It is to be hoped that a subsequent follow-up may provide an answer to this question.

The conclusion has special interest in the light of the notable sex difference, found at the time our subjects were located, in the incidence of high ability. In the regular group the ratio of boys to girls is 121 to 100; in the high-school group (selected in 1921–1922 on the basis of the Terman Group Test) the ratio is 183 to 100. If in the regular group we consider just the subjects whose I.Q.'s on the Stanford-Binet follow-up are over 135, the ratio is 158 to 100.* Thus it appears that boys not only are more likely than girls to have high I.Q.'s but are more likely than girls to retain the high I.Q.'s which they have evidenced in their early school years.

If we consider just the regulars over fifteen years of age whose scores on the follow-up Terman Group Test would entitle them to a place in the gifted group according to the standard originally used in the selection of the high-school group, the sex ratio is at least 147 to 100.

Educational Progress and Scholastic Achievement

Seventy-four per cent of our gifted boys and eighty-four per cent of the gifted girls are accelerated in school. These figures are to be compared with 67 per cent acceleration of both boys and girls at the time of the original survey. The mean age of graduation from the eighth grade is approximately thirteen years, one month for the boys and twelve years, ten months for the girls; from high school approximately sixteen years, ten months for the boys and sixteen years, eight months for the girls.

The grades of gifted pupils of both sexes average far above unselected high-school pupils. They receive *A* grade in their separate school studies about four to eight times as frequently as unselected high-school pupils in the same studies, the girls in 75 per cent and the boys in 45 per cent of their school work. The gifted girls receive higher average marks than the gifted boys in every high-school course including science and mathematics. No gifted girls and a negligible proportion of gifted boys have failed in any of their high-school subjects.

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* This ratio makes statistical allowance for the fact that a slightly greater proportion of the girls than of the boys were reached and tested on the Stanford-Binet during the follow-up.

Eighty-five per cent of the gifted boys and seventy-eight per cent of the girls have gone or are definitely planning to go to college. Gifted boys attending Stanford University make a scholarship average that is slightly above that of Stanford freshmen, but not so high as that of students who come to Stanford from their high schools with "gold seal" diplomas awarded for high scholarship. The selection of Stanford students is so rigorous that our gifted subjects at Stanford are competing for grades with students whose level of ability averages only a little below their own and who are also not far from two years older on the average. Of 54 members of the gifted group who have been graduated from Stanford in departments from which Phi Beta Kappa membership is drawn, 30 per cent were elected to Phi Beta Kappa; and of 58 who were graduated from the University of California, 28 per cent were elected as compared with 10 per cent of all seniors who are graduated from eligible departments. The proportion of our group who have been graduated from Stanford "with distinction" or "with great distinction" is more than twice as great as for the generality of Stanford graduates.

Composite Portrait of the Gifted Child

A large part of these studies has been devoted to a delineation of the characteristic traits of gifted children considered as a group. This seemed necessary because of the large amount of erroneous opinion that has been disseminated in connection with this aspect of the problem. Further justification for making this one of the major objectives of the research is found in the fact that the educational issue as to what the school should or should not do with gifted children hinges largely on their group characteristics. We believe that the data secured have enabled us to delineate these characteristics faithfully, at least so far as the main outlines are concerned. There is probably no part of the study which has yielded conclusions less likely to be materially modified by further investigation. It seems to have been satisfactorily demonstrated that:

1. Gifted children come predominantly from family stocks of decidedly superior intellectual endowment and of slightly superior physical endowment.

2. These family stocks have greatly decreased in fecundity during the last two generations and have already reached the point where they are not maintaining themselves.

3. The mean I.Q. of siblings of children who are in the I.Q. range above 140 is about 123, or almost exactly what would be expected if the correlation between siblings in the general population were in the neighborhood of .45 or .50.

4. Intellectually gifted children, because of better endowment or better physical care or both, are as a group slightly superior to the generality of children in health and physique and tend to remain so.

5. Children above 140 I.Q. are not as a group characterized by intellectual one-sidedness, emotional instability, lack of sociality or of social adaptability, or other types of maladjusted personality.

6. Indeed in practically every personality and character trait such children average much better than the general school population.

7. In social-intelligence ratings, social interests, and play activities,

gifted children as a group are either normal or superior.

8. In mental masculinity and femininity gifted boys rate on a par with unselected school boys of corresponding age, while gifted girls deviate significantly from the norm of their sex in the direction of greater masculinity.

9. In the traits measured by the "character" tests the typical gifted child of nine years is on a par with unselected children of thirteen or fourteen years.

10. In trait ratings by teachers gifted children show their superiority to the average most of all in intellectual and volitional qualities and least in physical and social traits.

11. In school progress the typical gifted child is accelerated by 14 per cent of his age, but in actual mastery of the school subjects (as shown by achievement tests) he is accelerated by more than 40 per cent of his age.

12. At the age of ten years there is no correlation between achievement-test scores and the number of years gifted children have attended school.

13. As a rule gifted boys maintain or almost maintain their relative superiority to the common run in intelligence, at least through the period of adolescence.

14. Girls somewhat more often than boys show a drop in the I.Q. as adolescence is approached, or soon thereafter.

15. School achievement as a rule continues through high school and college to be in line with the I.Q. originally found in 1921–1922.

16. Subject failures in high school are practically never incurred by children of this grade of intelligence.

17. Nearly three-quarters of the total marks earned in high school by gifted girls and nearly half of those earned by gifted boys are of *A* grade.

18. Gifted children of the senior high-school year test on the average above the ninetieth percentile of the general run of high-school seniors on the Iowa-High-School Content Examination, or from 1.5 to 2.0 S.D.'s above the mean of high-school seniors in general.

19. More than 90 per cent of gifted boys and more than 80 per cent of gifted girls (in this group) go to college, most of them remaining to be graduated.

20. Those who are graduated from high-grade universities win Phi Beta Kappa or other graduation honors about three times as frequently as do the general run of graduates from such institutions.

It is to be hoped that the superstitions so commonly accepted relative to intellectually superior children have been permanently swept away by the factual data these studies have presented. It is simply not true that such children are especially prone to be puny, overspecialized in their abilities and interests, emotionally unstable, psychotic, and morally undependable; nor is it true that they usually deteriorate to the level of mediocrity as adult life is approached. Educational reforms in the direction of special classes, special curricula, and special classroom procedures can now be confidently formulated on the foundation of established truth. If special classes and special procedures are to be opposed, it must henceforth be upon other grounds than those which have been most commonly alleged. One would like to believe that the stage is set for one of the most important educational reforms of the century; a reform that would have for its end the discovery, conservation, and intensive cultivation of every form of exceptional talent.

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CHAPTER XVIII

STUDY OF PERSONALITY DEVELOPMENT*

JEAN WALKER MACFARLANE

Objectives

A major objective of the Child Guidance Study has been to portray the course of development of numerous specific aspects of personality and to investigate relationships between behavior patterns and other variables. Both adaptive and maladaptive patterns have been studied. The other variables include, or are based upon, measures of physical status; physical growth patterns; the child's intelligence and rate of intellectual development; socioeconomic measures and other aspects of the child's physical environment; data pertaining to the personality characteristics of parents and siblings and of interpersonal relationships in the home; and data pertaining to the school and social environment.

A second objective has been to study in a normal group of children the frequency, persistence, severity, and dynamics of specific maladjustive behavior, by age and by sex, and to discover the relationships of earlier and later manifestations of problems. These facts are of direct interest and will further serve as a check upon the generalizations made from the studies of pathological samples which have dominated the literature on personality.

A third, and perhaps the most important, aspect of the study is to add to our knowledge of the critical differentials whereby some individuals give up or modify early infantile patterns and develop mature, sturdy, and effective personalities, while others rigidly and neurotically cling to immature and ineffectual patterns or disintegratingly revert to them.

A fourth aim has been to compare the persistence of specific maladjustive behavior (stammering, fears, etc.) in a group subjected to guidance procedures and in a group equated but unguided.

Lastly, a more articulate and refined methodology has been sought in the field of personality investigation.

Basic Points of View and Special Questions to Be Answered

In a pioneering stage of a discipline where a small body of ordered facts exists, it is difficult to have neat and clean-cut hypotheses susceptible of final proof, disproof, or explicit modification. When this pioneering stage is in a field as complex and multifactor as personality dynamics, concise (and thereby limited) hypotheses failing to take account of large areas of interactive factors often involve relationships so far out of dynamic context that little of permanent value accrues. The other extreme of practice, quantitative fact-finding procedures predicated upon no discoverable criteria of fact sampling, remain essentially unintegrated even after elaborate statistical attempts to induce integration.

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* A 20-year still-continuing cumulative study sustained by grants from the Laura Spelman Fund, the Rockefeller Foundation, the General Education Board, and the University of California, and by assistance of the Work Projects Administration. For further details see Macfarlane (2). In this chapter a statement of objectives, basic points of view, special hypotheses, data sought, procedures followed, and sample findings is given; it is adapted from an article by the writer (3).

The working philosophy of the Guidance Study has led to an attempt to utilize wide arrays of facts with concise formulations of questions to be answered. Clinical experience, concerned with the dynamic interactions of individuals, has pointed the conviction that the explanation of personality development, personality success or failure, will come from a rather broad sampling of facts, articulated in a fashion that their interactions may be observed, weighted, and evaluated. Clinical experience before the study began and after the study was undertaken has brought the conviction that certain areas of interaction are more important than others and are therefore areas to be samples extensively and intensively. The evidence from the first 13 years of this study points to the fact that certain configurations of biological and environmental factors tend to produce a fairly smoothly functioning personality; other configurations, a disturbed or disordered one. The combination of experience, 13 years of empirical findings, analyses of findings, and even wishful thinking has left so many questions still unanswered, however, that the clinic cannot as yet subscribe to a closed theoretical system. We have been organized around a simple and obvious structure which eclectically admits of any methodological attack that offers promise of yielding information in what appear as pertinent areas of interaction. It will be apparent on page 312 what areas are regarded as important, and within the limits of our techniques and our budget.

Since, however, even a "simple and obvious structure" involves theoretical notions, concepts, and hypotheses, whether implicit or explicit, and since these in turn determine the content areas and the form of empirical findings, it is essential to be conscious of and articulate about these determining tools. Space precludes, unfortunately, more than a brief and generalized orientation in this respect.

The basic mechanism of biologic life is adaptive activity. The organism in disequilibrium (*i.e.*, when stimulated) is characterized by immediate activity which continues until equilibrium is restored. The need for adaptation depends upon disequilibrium; the manner of adaptation depends upon the structure and past habits of the organism, the nature of the stimulation from which it seeks relief, and the restrictions imposed by the environment. Personality is regarded as the patterned flux of these adjustive activities in a given but constantly modified psychobiological organism.

These adjustive attempts of the organism may be via simple chain-reflex routes or by simple learned routes. When confronted with sudden, intense, prolonged, or ambiguous stimulation, however, or when blocked in his adjustive attempts, the organism may explode into the diffuse activity called "emotional behavior." If the disequilibrium is less extreme, he may learn to travel by substitute or indirect routes—on the overt or externalized levels of action and speech and/or on the covert or internalized levels of psychosomatic response, thinking, or phantasy.

These adjustive devices may be episodic or recurrent. If recurrent and externalized, they are given behavior labels. If recurrent and internalized, attitudes or needs are inferred and personality-trait labels are assigned. These adjustive attempts may be damaging or beneficial to the well-being of the organism, acceptable or unacceptable to the social environment. But regardless of how stabilized the patterns or how diffuse the activities, they represent adjustive devices to seek equilibrium, to satisfy needs, to sidestep or placate pressures. No matter how mediated, described, labeled, or evaluated, this flux is a series of resultants of what the individual has had to adjust *with* and what he has had to adjust *to*.

With this simple and basic concept of adaptation or psychobiological adjustment, explicit inspection of the history of these interacting aspects—the organism, the pressures put upon it, and the adaptive processes evolved—becomes the content area of research in personality development. Let us look at each of these aspects separately, and then in the context of the other two.

The Organism.—A comparative study of human beings, or of any species, shows communality of structure which makes for communality of needs, response patterns, and susceptibility of stimulation. Superimposed upon this communality is a large array of individual differences which make for differing susceptibilities to stimulation, differing needs, and differing response patterns. Whether these differences are in large part a function of heredity and maturational processes, or in large part a function of modification of basic structure by health, special experiences, or differing environmental pressures and assaults, they exist and must be inspected along with common structure in terms of their meaning to the adjustive process.

Differences exist in morphology, size and rates of growth, muscular equipment, nervous reactivity, sensory acuity, energy level, mental ability, achievements, tensional states (directly organic and produced by conflicting reaction patterns), etc. Not only are there specific differences, but differences in configurations of equipment occur which have differing influences both upon susceptibility to stimulation and upon response patternings. The child who is at either end of the distribution curve not only has different organic stresses to contend with than the child in the middle of the distribution—a fact which may influence behavior appreciably—but also develops totally different attitudes and reaction patterns toward himself through continuous comparisons with the group. Additionally, because certain behavior is precluded or fostered for him by these facts of equipment, he may receive differential treatment by the social environment, and an even larger discrepancy in behavior may appear than these structural differences (in and of themselves) would produce.

Especially important with respect to personality development is variability in structure which precipitates behavior that conflicts with mores. Take, for example, variability in sexual maturity. The child of marked precocity, marked retardation, or atypical development not only has variant behavior precipitated directly, but he may be subjected to marked disapproval which results in hostility, defiance, or guilt feelings with subsequent compulsive releases, internalized tensions, or a variety of defense patterns.

It is obvious in the light of our basic concept of psychobiological adjustment that we need to inspect structure in context—similar structures in similar and dissimilar contexts, dissimilar structures in similar and dissimilar contexts, if we are to evaluate and weight the contributions of structure or structure configurations to personality.

The Pressure upon the Organism.—Just as there are communalities and differences in structure, so too we find communalities and differences in pressures—internal and external—which impinge upon the organism and precipitate the need for and contribute to the manner of adjustive activities. To have meaning these stimulus pressures must be looked at in the context of the organism's vulnerability or threshold of response at different levels of development, with differing past experiences and different response habits.

The varieties and combinations of pressures are myriad. The major classifications are: (*a*) internal organic ones which vary with metabolism, age, and health; (*b*) external physical ones; (*c*) external social ones which not only precipitate responses but tolerate, reward, punish, or prohibit the forms of responses and thereby determine which shall be overt and which, of necessity, shall be covert; (*d*) internalized pressures built out of previous experiences into habits and attitudes which come, in time, to have almost an autonomy of their own.

Among the agencies of social pressure is the family, which carries the liaison functions between biology and culture and is a highly important area to inspect in a study of personality development. Family pressures involve adjustment to different family members with their common and unique personality characteristics; to the behavior, security, or tensions growing out of their interpersonal adjustments; to their variant behavior under varying conditions and moods; and to their compatible or noncompatible values, expectations, and training techniques. These pressures offer a continuous, complex, and varying stimulus flux to the child in the early period of intimate dependency. He has to adjust to them not only individually but in various combinations which may alter the direction of pressure. His family members not only stimulate him to activity, but, additionally, they bring further pressures to bear on the form of the response activity which they will tolerate.

The same person, too, may be a stimulus to antagonistic or ambivalent response patterns, for in the usual family setup the parent in the role of trainer induces anger or resistance responses but also brings relaxing, friendly responses in his functions of affectionate contact and satisfying needs. This basic situational stimulation to conflict of responses, without suitable channeling of patterns to release the conflicting responses, appears an important factor in later ambivalences in intimate contacts. For a child who has successful response patterns established, the stimulus situation may suddenly shift by the birth of a younger sibling, the death or separation of parents, the arrival of a grandparent to live in the home, etc.

When school begins and the child spends more hours away from home, family pressure may be relatively less potent. But during adolescence, even with a wider social pressure at work, family pressure may become even more acute for several reasons. With the advent of the child's sexual maturity, the parent is susceptible to easy flare-ups of his own adolescent insecurities and anxieties, resulting in more tensions in his relationship to his child. With the adolescent's awakening interest in the opposite sex, the parent undergoes deprivation of certain libidinal satisfactions which have given him support, security, and a function, and because of this deprivation he may behave differently to his child and create for him new adjustive problems. Additionally, the unsteady or ambivalent drive by the adolescent upon his parents for both freedom and security may provoke ambivalent behavior in the parent. The further parental anxiety over the limited time left for "molding" the child for professional or social accomplishment may make for more intense and persistent pressure during this period. The effect on the adolescent of living out or failing to live out parental expectations may or may not be suitable to the adolescent's needs and if unsuitable may easily result in hostility, erratic behavior, or defeatist patterns. All this intensification of pressure may be occurring at a period vulnerable not only physiologically but socially and because in his new need for intimacy the adolescent may be baffled and chagrined by the reactivation of old patterns associated with intimacy during his very early dependent years.

Similarly, other social pressures outside the home might be inspected in terms of their meaning to the child. For the adolescent, pressure from what Freudians call the "superego" (values of the family and the culture, which have been taken over and internalized as attitudes) comes into more prominent play and calls for adjustive behavior which may be in conflict with parental expectations or biological needs.

That out of this heterogeneity of stimulations fairly stable or characteristic personality patterns emerge appears due much more to certain stable and fairly constant pressures than to chance episodes, although highly traumatic episodes at certain critical periods may alter the organism's vulnerability, disrupt successful patterns, or make them ineffective in changed conditions. It is obvious, therefore, that a detailed account of pressures becomes an important aspect for the understanding of personality dynamics.

The Adaptive Processes Involved.—A brief statement follows on the nature and mechanisms of the adaptive processes. For the sake of brevity these responses may be classified as: *A*) simple and direct, *B*) diffuse or massive, and *C*) indirect.

A) Much of the flow of our adaptations, the routine of our lives, is based upon habits built up out of *simple direct* adjustive behavior. Equilibrium may be restored directly by: (*a*) behavior which changes the reactivity of the organism (*e.g.*, eating when hungry), (*b*) behavior which removes the stimulus (*e.g.*, pushing hair out of our eyes), or (*c*) the organism's removal of itself from the stimulus situation (*e.g.*, out of the sun, out of earshot of a mother's orders, etc.). But if simple direct behavior does not restore equilibrium, the organism may then explode into the behavior we describe as diffuse or massive, or, in time, it may learn the indirect routes to equilibrium.

B) Diffuse or massive adjustive behavior (*e.g.*, where there is heavy emotional involvement) occurs in response to (*a*) sudden or violent or cumulative stimulations, to (*b*) thwarting of organic drives, conflict of drives, or thwarting of old response patterns, and to (*c*) failure of old response patterns to bring solutions and thereby restore equilibrium. This is a pattern of high frequency during the early years, when the organism is confronted with many surprises and has as yet learned few acceptable channels of indirection. It is frequent, too, during other periods of organic change and stress (*e.g.*, menarche, menopause, illness), as well as during periods of social change and stress before suitably channeled responses have met these changing adaptive needs.

C) Indirect or substitute response patterns are evolved when direct or diffuse and massive ones fail. These indirect ones may be combinations of action, speech, psychosomatic responses, thinking, or phantasy. Of this substitutive order are distractive activities which shut out the conflict (*e.g.*, physical activities, busy work, misbehavior, reading detective stories, etc.) and which may be so recurrent as to become highly stabilized patterns; and, whether useful or unproductive in long-time terms, they are essentially adjustive attempts. Solutions may be sought via complicated withdrawal patterns—timidity, negativism, phantasy, fears, somatic preoccupations, the building up of inhibitory superego values, and, in extreme cases, schizophrenic withdrawal. Solutions may be channeled into projected rationalizations, such as gossiping, blaming parents, circumstances, heredity, the government, or fate, and, in extreme forms, into systematized paranoid reactions. Compensatory activities may be set up—*e.g.*, mental superiority for physical inadequacy, bullying behavior to compensate for cowardly feelings, martyred service for hostility, etc.

Many of the compensatory patterns bring the support of achievement; many bring disapproval which adds to tension. It becomes important for the understanding of personality to know the laws of learning that mediate both successful and unsuccessful channeling of response patterns and personality trends and to look at both overt and covert responses of individuals in terms of what adjustive need they are attempting to satisfy and what pressures they are attempting to accept, sidestep, or placate.

Program of Data Collection

The sample—252 children and their respective families—was arbitrarily selected upon the basis of every third birth (January, 1928, to July 1, 1929) in Berkeley, Calif. Two groups (126 in each), a guided and an unguided control group equated on the basis of socioeconomic findings, have been followed for 14 years. Active cases now included are 113 families in the guidance group, 101 cases in the control group.

Essentially clinical in nature, this undertaking differs from other clinical studies in two major respects. It has attempted cumulative observation of *contemporaneously developing* adjustments and maladjustments in a *normal* sample. The usual clinical procedure has been to attempt to unravel the antecedents of already developed maladjusted behavior, in a so-called "problem group."

Several panels of investigation were undertaken:

1. Pre- and circumnatal data (for both groups). Not cumulative.

2. Systematic cumulative records of health, regime, and physical growth—physical examinations, anthropometric measurements, developmental X rays, and photographs (for both groups). This is supplemented with more intensive medical and laboratory examinations on certain extreme or atypical cases.

3. Systematic records of mental development and interests (for both groups).

4. Systematic records (for the guidance group) of the development of behavior attitudes and personality patterning as seen through the eyes of parents, siblings, teachers, classmates, the child himself, and the clinic staff. In the early years the parents were the major informants; later when the child became more articulate, much more came from him. Still later, teacher and classmate opinions were available. Interview, observation, measurement, rating, and "projective" techniques (Rorschach, Murray Pictures, Play) have been used.* For the control group, systematic but superficial inventories of behavior and personality patterns have been obtained from parents, as well as from teachers, classmates, and projective material.

5. Systematic records of physical and psychological environment, including the home and its personalities, the teacher, classmates, playmates, and neighborhood facilities and pressures (guidance group, and on school aspects both groups). At some time during the future one set of intensive interviews on family situations and interpersonal relationships is to be secured on the control group. Space precludes a discussion of the varieties of techniques used and the methodological problems inherent in each technique—problems which had to be solved before the empirical data could be described or evaluated.

Program of Data Analysis

Our philosophy of data organization has been to utilize the assets of the two conventional methods, case study and statistical analysis, believing that each

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* See Chaps. XXIV and XXXII by E. H. Erikson and R. N. Sanford, respectively, for further details on this aspect.

method has a contribution to make not available to the other and that when used in combination they permit not only a wider array of generalizations but more sharpened and fruitful ones. Briefly stated, statistical analysis has as its *modus operandi* the statistical isolation of variables and as its focus of interest the relationships obtained between segments of behavior, physical and mental traits, environmental data, etc. It treats the individual merely as a point on a continuum. Its value lies in the normative material it orders, in the segmental relationships it clarifies, in the determination of an individual's position in a group, in the group differences it establishes (*e.g.*, between age, sex, body build, social groups, etc.), and in its objectivity. It permits group prediction for these isolated variables or patterns of variables, if it studies groups over a span of years. It does not permit generalizations about the functioning dynamics of personality, nor predictions for individuals with respect to dynamics.

The clinical case-study approach has as its focus the individual, and interpretative synthesis rather than analytical isolation is its *modus operandi*. It looks at the intrapersonal relationships of behavior, attitudes, and peculiarities of equipment and environment. It permits generalizations about the dynamic relationships which organize an individual's personality and about the meanings to individuals of the segments of his behavior. It permits prediction for the individual, if it studies individuals over a span of years. It does not permit defining an individual's position in a group, nor does it permit group generalizations and group predictions, except by the piling up of a large number of individual studies comprising a representative group. It has the obvious limitation of less objectivity, although a long-time study, such as the one under discussion, permits the assessment of the validity of the predictive criteria used by the various schools of interpretative synthesis.

The two approaches combined thus complement and supplement each other and serve as checks when either attempts generalizations not permissive of its own method. The complex methodological problems of each approach to such a multifactor study as the evolution of personality dynamics are outside the limits of this chapter.

Sample Findings

The sample findings which follow are fragmentary and of three sorts: (*a*) normative (*i.e.*, age frequencies); (*b*) relational in the statistical sense; and (*c*) clinical in the sense of interpreted adaptation meaning for individual children.

Frequency and Persistency of Problem Behavior during the Preschool Years.*—We have found that no normal child is completely free of adjustive devices that get labeled as "problem behavior"—the average number varying during the preschool years from 4 to 6 per child, out of 63 descriptive or interpretive labels systematically covered at each age level.

Frequency was found to vary with age for most problems (see Fig. 1). Soiling and diurnal and nocturnal enuresis decreased with age and were eliminated in the order named. These age-frequency curves look very much like learning curves and, of course, represent a composite picture of maturation and the training techniques used. Constipation, masturbation, and restlessness in sleep showed no trends with age for the preschool period. Thumb sucking decreased as nail biting increased. Overt tempers, fears, jealousy, and inferred oversensitiveness increased to around four and four and one-half years and then began subsiding. Since

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* Data collected by clinical staff, G. V. Sheviakov, H. Campbell, M. Atsatt, J. W. Macfarlane; statistical analysis by H. S. Conrad.

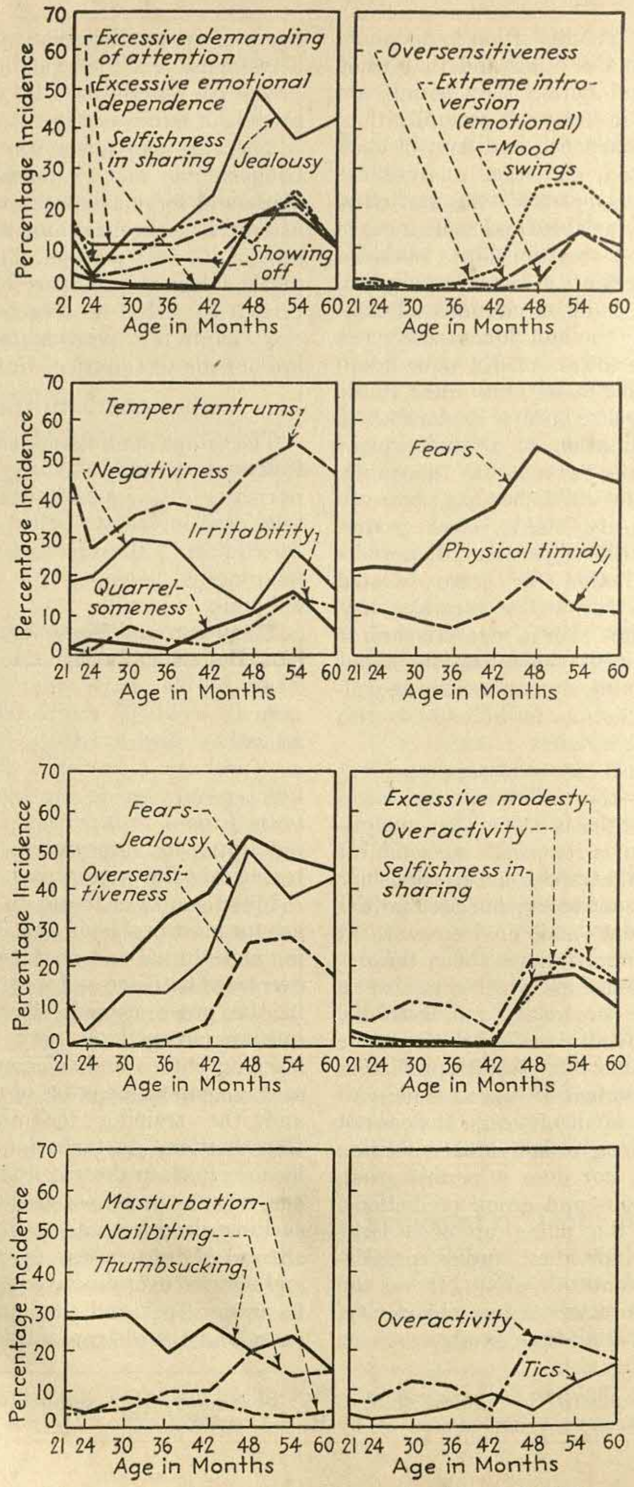

FIG. 1.—Age changes in incidence of problem behavior.

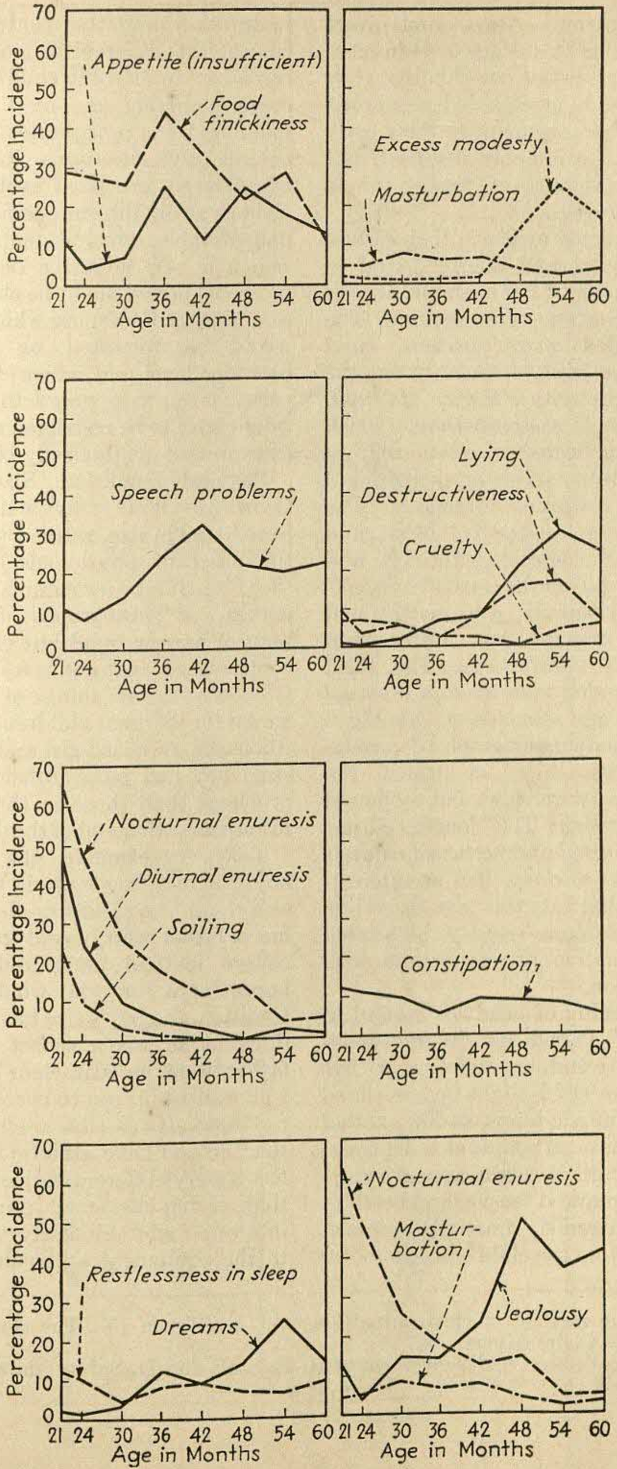

FIG. 1.—*Continued.*

temper tantrums, fears, and overt jealousy occur at one age level in more than 50 per cent of our children, they cannot sensibly be regarded as neurotic behavior when occurring in these early years, as so commonly assumed, but rather as evidence of tension or as adjustive devices.

There is some evidence that certain patterns, overt and inferred, tend to fall into clusters.* For example, at year five, four clusters were apparent. The first included *quarrelsomeness*, *mood swings*, *negativism*, *irritability* (in the sense of reactivity), *temper tantrums*, *jealousy*, and *competitiveness*, which show similar degrees of relationship to other problems, a cluster suggesting a labile or disturbed organism. The second cluster, suggestive of a child who is psychologically withdrawn and below par physically—*withdrawn*, *introverted*, *submissive*, *shy*, *somber*, and *excessively reserved*, was closely associated with *underactivity*. The third cluster included *masturbation*, *unusual sex interest*, and *stammering*. (See Fig. 2 for a sample cluster graph of correlational relationships in which the correlations were low but followed similar curves.) The fourth cluster included *diurnal* and *nocturnal enuresis* and *excessive modesty*. It is an interesting fact that at this age excessive modesty is more closely associated with eliminative processes than with masturbation.

The meaning of behavior labeled as "problem" varied for different children. For example, enuresis at five years in one child might be associated with poor muscle tonus, and in another with little or no attempts at toilet training; in a third it might appear symptomatic of marked tension and hostility following extremely drastic attempts at training before the child's psychomotor maturation permitted control. And, of course, the differential treatment accorded to an enuretic child by a tense, coercive mother and by a relaxed or indifferent one precipitates very different adaptive situations. In short, the adaptive pattern itself evolved by the child as an equilibrium device would, if unacceptable, precipitate further tension and new adaptive devices. This preschool period might be characterized as a process of learning which solutions would be tolerated on the overt behavior level and which on an overt verbal level, as opposed to those that would have to be restricted to phantasy or expressed symbolically or repressed.

Physical Condition, Size, Rate of Growth.†—Wide individual differences were found in size, rates of growth, and the onset of physiological maturity. (See Figs. 3 and 4 for cumulative growth curves and photographs of two boys, both of narrow build but of extremely contrasting height and rates of growth.) Obviously the meanings of these facts varied for different children, but on the whole the oversized girl and the undersized boy had more difficult adaptive problems than those in the middle or toward the other end of the distribution.

Take, for example, the undersized boy who may be small via the genes or as a result of a pituitary disorder. If he has a father who played guard on his college football team and had high hopes for a son who would carry on tradition, the boy's size has a markedly different adjustive aspect than if his father were an arm-chair intellectual who wanted his son to become a college professor. If his sibs are much larger than he and have athletic interests, he has a very different adjustive picture than if he has small nonathletically interested sibs. Similarly with respect to the equipment and values of play-

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* For the method of cluster analysis used, see Tryon (5). The cluster analysis was done by Claire Myers.

† Data collection under direction of H. R. Stolz and D. Sproul; data analysis by M. P. Honzik.

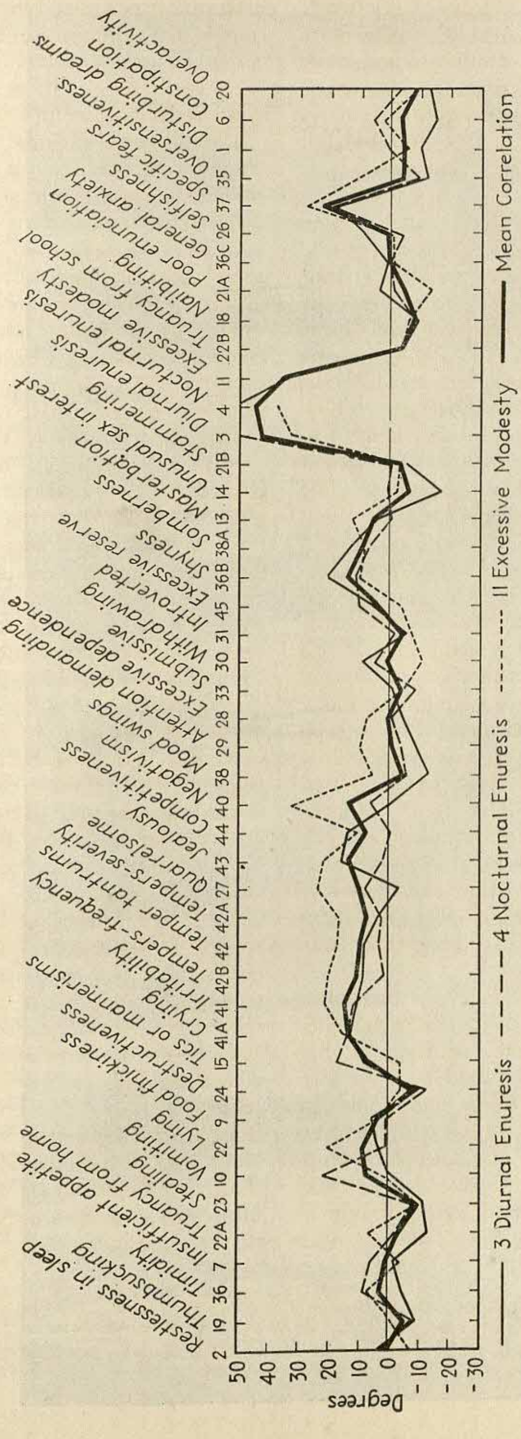

FIG. 2.—Cluster of behavior problems which bear similar degrees of relationship to other problems. Age of children, from 5-year-old guidance group.

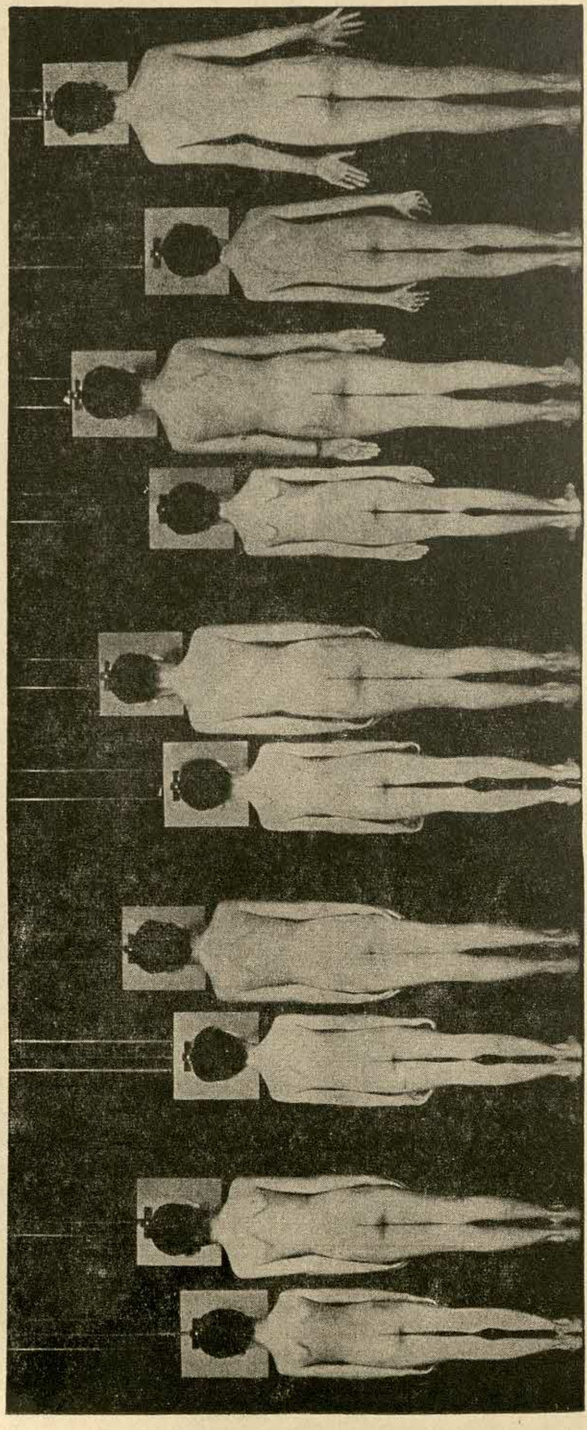

FIG. 3.—Extremes of growth.

mates, his adjustment needs show wide variations. His size, then, takes on meaning (*a*) in terms of the other aspects of his structural equipment; (*b*) in terms of the size of people with whom he is closely associated; (*c*) in terms of family and social expectancies and values connected with size or achievement dependent on size, values which tend to influence him or become his own; (*d*) in terms of the adequacy of other family and social supports; and (*e*) in terms of the success of direct or compensatory achievements which do not depend upon size. If he not only is small as a preadolescent but also is late in maturing, his position may become even more extreme and his adaptive problems even greater. In addition to this, his size changes at varying rates—very fast in the early postnatal months, more steadily from around three to eleven or twelve, then fast again during the so-called "adolescent spurt." His vulnerability may vary in a fast-growing or slow-growing period because of physiological changes or new adjustments to learn with and to his changing equipment, or because of new attitudes and pressures from outside to which he must adjust.

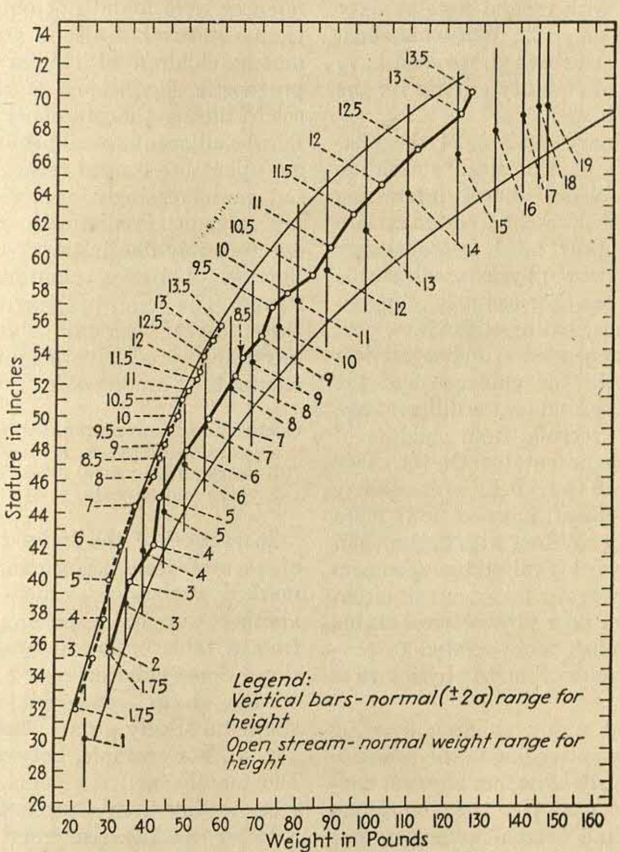

FIG. 4.—Two extreme growth curves. (*Based on Bayer and Gray.*)

For the preschool years, physical measurements were found to have more prognostic value than mental measures. For example, the correlation of height at twenty-one months with height at sixty months was .80 and of weight at twenty-one months with weight at sixty months was .72, whereas the correlation of mental tests at twenty-one months with mental tests at sixty months was only .32. When full, final height has been reached, we shall have available predictability criteria for the whole growth span.

A preliminary analysis of the relationship of physiological status to specific problems shows interesting results. For the preschool period certain problems appear much more closely related to poor physiological status than do others. For example, elimination problems, eating difficulties, nail biting, overdependence, and negativism show for both the guidance and the control groups, and for the different age levels, more recruits from children of poor physiological status. On the other hand, thumb sucking, overactivity, lying, and fears have a few more recruits from children with better than average physiological status. Tempers and jealousy get as many recruits from good as from poor physiological status and seem much more related to psychological factors than to physiological ones.

We found many children showing overreactive patterning in the presence of continuously irritating physical conditions. For example, the youngsters with hives and eczema were more apt to show irritable or temper responses than youngsters completely free from such conditions. Here again the meaning of illness or physical health depends not only upon the condition of the organism but upon the attitudes and personalities of the environment. A child with irritating physical conditions is more reactive but his reactivity will precipitate different adaptive devices, depending on whether his parents are overanxious about health, whether they are even-tempered or excitable themselves, and whether they are pedagogically skillful in directing nonirritating outlets for tension.

Intelligence.*—Wide individual differences were found not only in intellectual status but also in growth rates among children of similar I.Q. The prognostic significance of mental-test scores during the preschool years was fair for adjacent six-month or one-year age spans (r's ranged from .71 to .78), but was increasingly lower with increasing age spans. Prediction increased with age (possibly due in part to the introduction of better continua of test items). The following correlations for three 3-year periods illustrate the increasing predictive significance of mental tests among older children.

Correlation between mental scores at:
2 years and 5 years, $r = .32$
3 years and 6 years, $r = .66$
5 years and 8 years, $r = .70$

Inspection of the individual curves of mental test performance showed marked variations, which is merely another way of describing the data from a table of low interage correlations. Some children rose with respect to the group, some fell, and some showed a steady group placement (see Fig. 5). For example, between twenty-one months and six years, one child rose steadily from a percentile rank of 1 to 90—an I.Q. rise from 80 to 135; another child rose from an I.Q. of 89 to an I.Q. of 170. Another child dropped steadily (5 or 6 I.Q. points per test administration) from an I.Q. of 112 at twenty-one months to an I.Q. of 87 at six years; in this case, intensive investigation of physical and physiological factors has yielded no explanation of the drop.

In individual cases, of course, the meaning of intellectual level varies. An I.Q. of 100 has a totally different meaning in a family of I.Q.'s in the 80 range

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* Mental tests made largely by Lucile Allen, G. V. Sheviakov, Adele Jaffa; data analysis by M. P. Honzik.

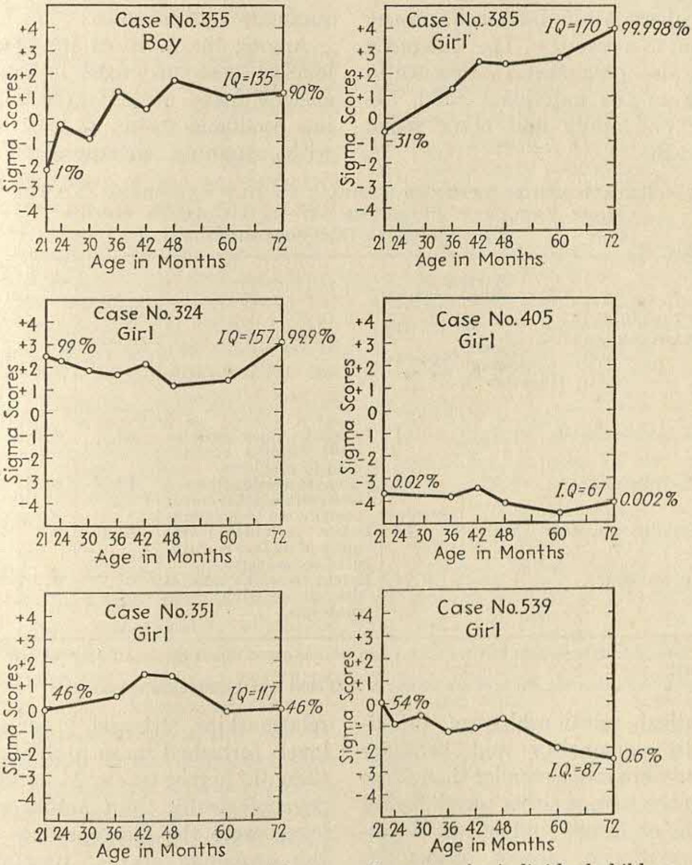

Fig. 5.—Constancy of mental test performance for individual children.

than it does in a family in the 130 range. Where parental expectancy or school expectancy or the capacity of sibs or classmates is far above the child's capacities, his adaptive processes will involve strain and probably defensive or compensatory patterns. In families where, because of tradition, a high level of intellectual achievement is a major value, a child even with good equipment may feel strain; certainly a child of relatively low ability will feel insecure and inadequate. We have examples of youngsters defensive about their real or imagined retardation, falling in achievement much below their capacities—in other words, withdrawing from the struggle; others become the class "cutups." To quote one child of the last variety, "If I cut up all the time and don't study, then they won't know I'm dumb. They will think it's just because I don't study." (She had an I.Q. of 130, but had a family tradition for producing college professors, plus two older sisters who because of age had higher mental ages.) Others compulsively indulge in delinquency, at least securing a reputation for bravery, if not brains, with their peers. Others dully commit to memory without incorporating as part of their equipment the academic materials with which they are confronted. With the cultural prestige attached to high ability, the strains accumulated find various forms of release or defense, the form depending on other factors. We find evidence, too, of smugness and conceit where adults have paid unwise attention to precocity. The difference in rates also precipitates difference in meaning to the individual child, depending on family and other social expectancies.

TABLE 1.—RELATIONSHIPS BETWEEN CERTAIN FAMILY VARIABLES AND THE TWELVE MOST FREQUENT PROBLEMS OF THE GUIDANCE GROUP
Twenty-one to thirty-six months

Critical ratios between problem frequency and	Average of critical ratios		Comments	Consistent[*] trends, per cent	Critical ratios, per cent		
	Disregarding sign	Regarding sign			Over 3.00	Over 2.00	Over 1.3[†]
Composite socioeconomic rating	1.11	−.51	Extent to which lower income families contributed to problems.	33.3	4.2	14.6	29.1
Education of mother......	1.08	−.54	Extenttowhichmothersof lower educational status contributed to problems.	33.3	6.2	14.6	27.0
Nervous stability of mother	1.11	+.35	Extent to which instability of mother contributed to problems.	33.3	2.1	14.6	29.1
Marital adjustment.......	1.52	+.76	Extent to which marital discord contributed to problems.	66.7	6.2	26.0	56.2

[*] Consistent trends: where critical ratios are in the same direction in all four of the age levels investigated.

[†] 1.3 or over means the chances are 90 out of 100 that a real difference exists.

Statistical relationships of intelligence to personality and behavior problems were much smaller than those found in the case of either physiological condition or family influences. Excessive dependence, speech difficulties (largely enunciation), and enuresis are recruited from the lower I.Q. levels, whereas the higher I.Q. levels contribute, during these same preschool levels, more nail biting, stealing, lying, and attention demanding (correlations are low, indicating only slight trends).

Family Variables in the Preschool Years.[*]—Great variations occur among our families in socioeconomic status, education, personalities, and interpersonal relationships. Socioeconomic factors show relationships of less magnitude with problem incidence than do interpersonal relationships within the family. Table 1 shows the summary comparisons.

Among the 12 most frequent problems at these early ages, in only 1, *viz.*, specific fears, were correlations with low economic status as high as those with straining interpersonal family relationships, although lower economic levels furnished more problem recruits than did higher levels. More important psychologically than actual economic levels were the discrepancies between the economic status, practices, and attitudes of the parents when they were children and adolescents, the sudden lowering of family income (as during the depression, when at one period a third of our fathers were unemployed), inadequate income in terms of mobility ambitions, living beyond income with pressing charge accounts—all of which brought strains that were reflected in the children almost regardless of the size of the income. Consider, for example, the strains growing out of differing practices and attitudes with respect to management of income, which may carry the load of projected tension.

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[*] Data collected by clinical staff: G. V. Sheviakov, H. Campbell, M. Atsatt, C. Gear, J. W. Macfarlane; data analysis for early preschool period by E. P. Bretnall (1).

> We have found that if the husband's father managed all of the finances, his son takes it for granted as a male responsibility and prerogative. If he marries a woman whose mother managed all the finances, she feels, if her husband does not turn over his pay check to her as her father had done to her mother, that he is not really fond of her. And the husband feels that if his wife had any confidence in him, she would expect to leave the financial responsibility in his hands. The importance lies not only in differences of practices in the two families, but in the fact that affections, in the childhood of both parents, were tied to people with these differing practices. Each parent is wanting a token gesture of affection rather than the responsibility of handling the finances.*

Marital adjustment yielded more consistent and higher correlations with behavior and personality difficulties than did other family variables. Attention demanding, temper tantrums, negativism, food finickiness, overdependence, and daytime enuresis showed more recruits from families with unhappy or difficult marital adjustment. With increasing age, tempers and negativism showed increasing relationships with marital maladjustment, during this early preschool period. Thumb sucking and nocturnal enuresis, on the other hand, showed more recruits from happy and mutually supporting marital relationships. It is interesting to note that thumb sucking showed zero correlations with other problems and was recruited from the favorable end of the scale on practically all family variables, although with respect to physiological variables (health and energy level) it was more largely recruited from the unfavorable end of the scale.

Marital adjustment involves the meshing into a working arrangement of two temperaments and personalities who bring to the relationship similar and different experiences and attitudes with respect to cultural tradition, heredity, health, finances, standard of living, occupation, recreation, religion, sex, disciplinary procedures, etc. Statistics show that, on the whole and in spite of individual exceptions, marital partners are recruited from similar economic and educational backgrounds, whereas unlike temperaments attract each other, a fact which provokes continued interest, stability, and bafflements that directly affect the handling of children.

Let us look at one example, in which a boy of ten, in spite of the expressed and horrified remonstrances of his reserved, dignified mother, continued to open her mail to a point where, embarrassed but desperate, she sought advice. Since about other things he was perhaps, if anything, too amenable to her requests, one suspected immediately that the boy's "problem" was saturated with the parents' temperamental differences. The mother sufferingly violated her sense of privacy and admitted the double skeleton in the closet, *viz.*, that both her son (first interview) and her husband (third interview) opened her letters. The father, an expressive, demonstrative, quick-reacting person, in turn confided that he was terribly hurt because his wife did not think enough of his family to open letters from them. The letter opening of the child was the symptom of parental strain involved in meshing the mother's sense of privacy with the father's sense of sharing. Both admitted that each had derived much from the other. The mother stated that since she had married she had had more joy and happiness from her husband's bubbly, nonprivate intimacy than she had ever had in her own family. The father, too, openly stated that he received a great sense of support from her dependability —"She is a veritable 'Rock of Gibraltar' in a storm."

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* Macfarlane, J. W. Inter-personal relationships within the family. *Living,* Vol. III, No. 2, May, 1941.

Let us look at an example of anxious attitudes growing out of past experiences which bear directly on the child's patterns.

> We have had no severely finicky eater where we did not find anxiety about health in the background which had made the parents over-zealous about that symptom of good health, namely, eating. In the case of a little girl who was very resistive about her eating, the only serious area of vulnerability in her parents, such exaggerated behavior had been precipitated in both parents that their bridge club fined them 50 cents if they mentioned the child's eating habits. The father, a small-statured, small-boned person of small-statured, small-boned parents had to endure the taunts from larger and more competent boys in early childhood and attributed his size not to his genes, but to his poor eating habits as a child. He made up his mind that his children should eat and eat well! His wife, who had been subjected to the loss of both parents after long illnesses, likewise was over-anxious, and their healthy little tyrant wallowed in her power which found its symptomatic fulfillment in not eating when they were present.*

Parents' agreement on discipline showed a fairly high correlation with marital adjustment and much the same correlations with individual problems as obtained for marital adjustment. Fewer problems are reported or found among children of relaxed mothers than of mothers who are worrisome, uneasy, or tense in their relationships to their children. Although the correlations were low they were consistent in direction for speech problems, negativism, and tempers.

Interesting and dramatic individual exceptions to the trends were found. Stable children, with little or no evidence of behavior or personality disturbances, were found in underprivileged and disturbed homes. Poorly adjusted children were found in homes with good marital adjustment and superior educational and economic status.

To summarize, it was found that when a home was psychologically unfavorable in only one or two respects, the youngster could usually run his course without much disturbance, provided the parents were themselves secure enough to give the child adequate security and affection. But in homes with a large number of unfavorable aspects, the youngster was likely to give indications of being disturbed in his emotional development and habits. Affection and security between and from the parents was found to be a major need for the children.

Statistical evidence is not yet available on differentiating trends associated with sibling birth order and sibling adjustments. We have clear evidence both clinically and statistically that insecurity of the type known as "jealousy" is an important factor in other maladjustive patterns; more problems and more severe problems occur in the jealous than the nonjealous group.† Clinical opinion suggests somewhat different patterning in only children, the older of a pair of boys, the younger of a pair of boys, the older of a pair of girls, etc. Other things being equal, we have the clinical impression that the older of a pair of boys is less likely to have confidence and ease in intimate social relationships; the younger of a pair of boys is less likely to have confidence in his abilities. In our group only children‡ tend to show, during the first five years, more overactivity, disturbing dreams, showing off, masturbation, and constipation; whereas children with sibs show more jealousy, quarreling, lying, destructiveness, and soiling difficulties. These differences are small but consistent.

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* *Ibid.*

† Analysis of data by J. Reynolds.

‡ Analysis of data by M. P. Honzik and W. M. Wickham.

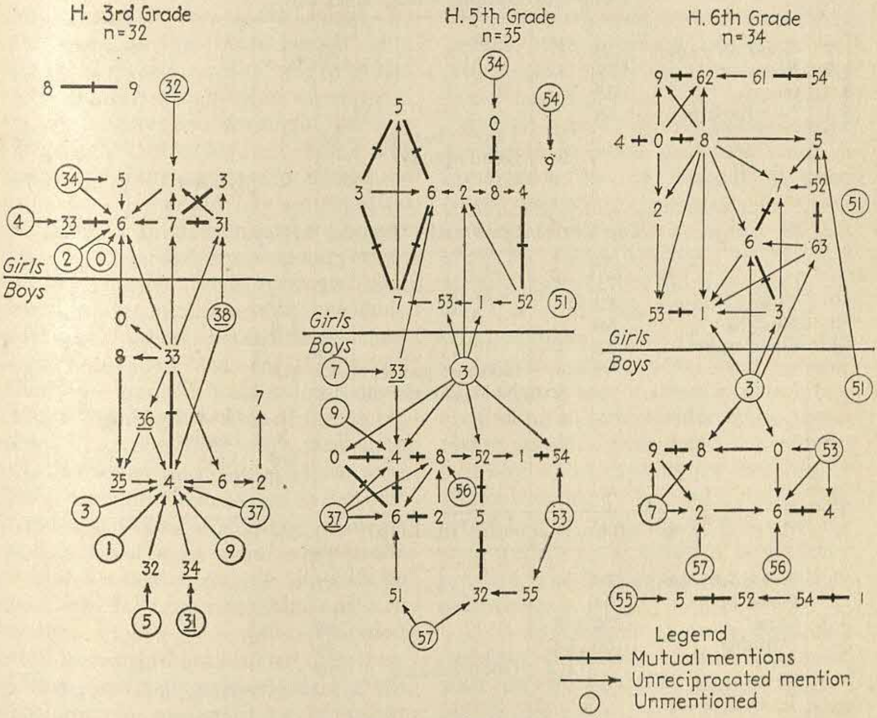

FIG. 6.—Class-friendship structure.

Reputation among Classmates.*—Reputation among classmates—an important area of psychosocial environment—shows marked individual differences in social approval disapproval, and notice. Some of our children obviously have had the continued support of marked social approval, being characterized as good-looking, good sports, friendly, good at games, and popular, etc., by a sizable proportion of their classmates. Some have carried a load of heavy disapproval, being regarded as sissies, poor sports, quick-tempered, unfriendly, poor at games, etc. Others have had both favorable and unfavorable characterizations. Still others have been ignored. The meaning of these characterizations obviously has varied for individual children. For example, one ignored child might be very aware of others and eager for attention and friendliness, as evidenced by his heavy mentioning of others on favorable items. Another ignored child might show equal awareness of others, but his characterizations of others would be almost entirely derogatory ones. A third ignored child, absorbed in his autistic life of plans, preoccupations,

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* Instrument used was a modification of the "Guess Who," devised by M. May and used by C. M. Tryon (4); *cf.* Chap. XXXI. Data collected by A. Davis, L. Smith, J. Schlatter, P. Bartelme; analyzed by M. P. Honzik and R. D. Tuddenham.

TABLE 2

First grade			Third grade			Fifth grade		
Rank		*r*	Rank		*r*	Rank		*r*
				Top Correlations with "Real Boy"				
1-2	Good at games	.59	1	....	.70	1	....	.82
1-2	Popular	.59	4	....	.61	3	....	.68
3-4	Quiet	.58			—			—
3-4	Not bashful	.58			—			—
			2	Takes chances	.68	4	....	.54
			3	Good sport				—
						2	Leader	.78
				Top Correlations with "Popular" (Boys)				
1	Quiet	.71	2	....	.72			—
2	Takes chances	.62		....	—	2	....	.68
3	Real boy	.59			—	4-8	....	.61
4	Good sport	.56	1	....	.74			—
			3	Good at games	.65	4-8	....	.61
			4	Not quarrelsome	.63			—
						1	Good looking	.74
						3	Leader	.64
						4-8	Tidy	.61
						4-8	Friendly	.61
				Top Correlations with "Real Girl" ("Little Lady")*				
1	Not quarrelsome	.70	4	....	.57		....	—
2	Good sport	.64			—			—
3-5	Quiet	.56	3	....	.58			—
3-5	Popular	.56	1-2	....	.59			—
			1-2	Good looking	.59			—
						1	Doesn't take chances	.63
						2	Doesn't fight	.49
						3	Not good at games	.45
				Top Correlations with "Popular" (Girls)				
1	Good sport	.79		....	—	3-4	....	.69
2	Not quarrelsome	.76	2-3	....	.74			—
3-4	Quiet	.71	2-3	....	.74			—
3-4	Good at games	.71			—			—
			1)	Good looking	.76	1	....	.79
			4)	Doesn't get mad	.67			—
						2)	Friendly	.78
						3-4	Neat and tidy	.69

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* By the fifth grade obviously our question was not getting at the real and feminine girl as it did in the earlier grades.

and phantasies, might be little dependent upon others and ignore them almost completely.

Another important array of differences occurred with respect to placement within or outside of clique formations or social groupings of the class. For example, one child might be mentioned as the "best friend" of a third of the class; another might be in a compact little clique, all of whom mention each other; another might mention several children as his best friends and have the feeling completely unreciprocated; another might be mentioned by no one and in turn mention no one. The meanings of friendship support or lack of it varied for different children. Some isolated children were extremely unhappy, others belligerent, others seemed incapsulated in their own phantasies and internalized interests. Figure 6 shows one class of friendship structure in the third, fifth, and sixth grades, respectively. It can be seen that Boy 3 was never mentioned as the best friend of anyone. In the third grade he mentioned the most popular boy in the class as his best friend, in the fifth he mentioned four boys and three girls as his best friends (the girl mentioning being more typical of isolated boys than of those with male support), and in the sixth grade he was getting ever farther away from the boy pattern in mentioning four girls and two boys. It is clear that he did not give up the struggle for inclusion, although he turned for support to unreciprocating girls. In point of fact, he unintuitively barged into many social situations, accumulating (on the rest of the test items) a conspicuous and derogatory reputation. Boy 4 shows an interesting shift. He was a star in the third grade (11 of 17 boys regarded him as their best friend), a member of a well-established clique in the fifth grade, but obtained only two mentions in the sixth grade—a marked shift in friendship status. Part of this shift to the periphery was due apparently to his family's being members of a minority group. He, unlike the first boy, withdrew from the social situation and sought his adaptations in non-overt ways.

Not only do individual children shift in status but the group shifts in its evaluations of the same characteristics. Table 2 shows what reputational items persist over a period of years and which ones shift. For example, the correlates of a "real boy" show being "good at games" as first in rank order at the three levels and increasing in importance ($r = .59$, .70, and .82 at the three levels in question); whereas "quiet," which in the first grade had an r of .58, almost dropped out of the picture (rank 12) by the third grade. In short, a child with a configuration of characteristics which gave him status in the first grade might find himself with a great loss of prestige merely by continuing to have similar characteristics at the fifth-grade level. Obviously, a boy for whom the *sine qua non* of male status was being regarded by others as a real boy would be more damaged by such a shift than would a boy whose prestige with himself lay in intellectual achievement.

It is of interest to note that the correlates of popularity for boys shift with age, the top rank being "quiet" for the first grade; "good sport" for the third grade, although "quiet" is still high; while both of these drop out of the top correlations at the fifth grade, with "good-looking" coming into ascendancy.

Similar evidence of persistence and shift characterize reputational values for the girls—entailing improved status for some girls and a marked loss for others—and similarly these shifts have very different meanings to different girls, and, hence, precipitate very different adaptive needs.

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CHAPTER XIX

STUDIES OF CHILDREN'S FEARS*

ARTHUR T. JERSILD

Introduction

This chapter gives an account of a series of investigations of the fears exhibited by children at various age levels and of the factors that contribute to the development as well as the overcoming of fear.

The term "fear," as used in everyday speech, denotes a large variety of experiences, ranging from overwhelming terror to milder forms of apprehension. By virtue of the complexity of what is known as fear, no single method of approach can, at the present stage of our knowledge, provide complete information concerning fear. Because of this, several different approaches were used in these investigations. In one approach attention was given primarily to signs of fear as revealed by the child's overt behavior—such as fleeing, cringing, running to an adult, crying or vocalizing, coupled with other symptoms of distress, efforts to avoid or withdraw, etc. This method of *direct observation* was utilized in one study in which parents, teachers, nurses, and others cooperated by keeping records of fears exhibited by children during their everyday lives. The method was employed also under more rigidly controlled experimental conditions.

These procedures involving the use of direct observation had certain limitations. It is not possible in an experiment, or in observations extending over a limited period of time, to obtain information concerning the almost countless circumstances that elicit fear in everyday life. Moreover, children may be subject to fears and yet fail, especially as they become older, to reveal their emotion through actions that an observer can readily detect, even though they may still be willing to report such fears to a friendly person. In the present series of investigations reports from individuals themselves were obtained through a series of *interviews* with children, through interviews with adults, through the use of a *check-list procedure* with children, and by way of *written anonymous reports* of fears recalled from childhood by adults.

The pages that follow will first give a brief account of procedure used in the major nonexperimental divisions of the larger investigation. This will be followed by a more extensive account of the methods used in the experimental divisions of the study. A final section will deal with findings.

Nonexperimental Procedures

Fears Reported by Parents and Other Adult Observers. *Procedures.*—The parents of 136 children cooperated by keeping records, for one or more periods of 21 days at a time, of the fears displayed by children when at home or in the care of their elders (7). The data included 153 such 21-day records.

Each parent was provided with mimeographed forms for recording observed fears and with a mimeographed set of instructions. The forms and the directions stressed the importance of describing as objectively as possible the situation in which the child gave signs of being afraid (place, time, what child was doing, persons present, apparent cause of fear, etc.) and of providing an account of the behavior of the child (words spoken, cries, other vocalizations, jumping, starting, withdrawing, running away, etc.) as distinguished from simply stating that the child showed fear. The parents were also asked to give information concerning such matters as the child's physical condition, his appetite, departures from the child's routine, etc., and to report the number of hours during which the child was observed each day.

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* More detailed accounts of these investigations are given elsewhere (4–10). Adapted with permission of *Child Development Monographs.*

In addition to the foregoing, 52 parents, teachers, and nurses who had children in their care cooperated by recording, on forms prepared for that purpose, evidences of fear that had come prominently to their attention without, however, aiming to make systematic observations over a period of 21 days.

Subjects.—The children who thus were observed ranged in age from less than one year to ninety-seven months. A majority of the children lived in a large city, but there was also a representation of children from the suburbs, small towns, and rural areas. The families included a larger representation in the higher socioeconomic levels than is true of the general population.

Treatment of the Data.—The categories used in classifying the data were based upon the data themselves. Rough compilations were made of situations that elicited fear, as described by the observers. Situations that seemed to have elements in common were grouped together and a tentative set of categories was devised. Further portions of the data were then analyzed and the categories were reexamined and revised as the need arose. The final set of categories included 23 major headings (designated by Roman numerals), and under each of these there were 80 subsidiary categories (designated by Arabic numerals). One general category, for example, included noises; under this were subcategories including (*a*) mechanical noises occurring in the child's immediate environment, (*b*) vocal noises occurring in the child's immediate environment, (*c*) vocal and mechanical noises from an unseen or unknown source, (*d*) "fear of agent or source of mechanical (or animal) noise apparently due to previous experience with noise" even though no noise now could be heard, and (*e*) fear of persons as in (*d*).

In the analysis of the records fears were classed according to their original source as far as could be ascertained (fear of a vacuum cleaner which, according to other information, apparently had originally frightened the child by reason of the noise it made, was classified in the Noise category). Many fears obviously seemed to be due to a combination of circumstances. In the treatment of the data, a tally of one was given to each factor that seemed to be responsible solely, or in combination with other factors, for the fears that were exhibited. The behavior or symptoms shown by the children when they were afraid, as described by the adult observers, were also classified and tabulated.

Reliability of the Categories Used in Classifying the Data.—Two workers independently classified a substantial number of records (353) according to the categories that were used in the treatment of the data. To find the agreement between the classifications, an item-by-item comparison was made between the two. When comparisons were made in terms of all of the detailed subcategories the agreement between the two workers was 90 per cent. When comparisons were made on the basis of more general categories (such as "Noise," including subcategories under the general heading of noise), the agreement between the two workers was 97 per cent. This procedure does not demonstrate whether the categories that were devised were the best or the wisest that might have been used, but agreement between independent workers does indicate the extent to which the definitions have been made explicit and the extent to which other investigators in the same field can either utilize the same scheme for treating other data or can demonstrate in detail what the defects of the classification might be.*

Reports by Children and Other Individuals Concerning Their Own Fears. *Interviews with Children.*—The subjects interviewed were 398 children, aged five to twelve years, and included 25 boys and 25 girls at each yearly level, with two exceptions (10).

Check-list Approach.—Instead of simply being asked to recall and describe their fears (as in the interview study), 1,100 fifth- and sixth-grade children were presented with small booklets which contained brief one-sentence descriptions of 25 situations which, according to earlier findings, had frequently been named by children in describing their fears (6). Each child was asked to check whether he *often*, *sometimes*, or *never* "worried" about each of these situations. The percentage of children who will testify that they have "worried" about a given circumstance—such as failing on a test at school—when they are specifically asked to report concerning this item will be considerably larger than the percentage of children who happen to mention failure on a test when they simply are asked, without prompting or leading questions, to describe their fears. The interview procedure is likely, however, to give a better indication of the range and variety of conditions feared by children.

Anonymous Reports by Adults of Their Own Childhood Fears.—Written anonymous reports of fears recalled from childhood were submitted by 303 undergraduate and graduate college students, ranging in age from eighteen years upward (7). The adults were provided with mimeographed forms that included a number of detailed questions and directions.

This part of the study was undertaken to obtain incidental information on certain points, including the nature of childhood fears when viewed in retrospect by adults or when interpreted in the light of later experiences, as compared with the fears displayed by children themselves in the presence of adult observers or as compared with the account children themselves give of their fears when questioned during interviews.

Experimental Studies of Fear

The aim in these studies, conducted by F. B. Holmes (4, 5), was to observe and record evidences of fear shown by young children under controlled experimental conditions. In the main experiment the subjects included 105 preschool children ranging in age from twenty-four to seventy-one months. Smaller numbers were employed in supplementary studies of methods of overcoming children's fears.

Behavior of Children in Controlled Situations. *The Fear Situations.*—Eight situations were employed in the main body of the study. Among other considerations that were taken into account in selecting and arranging these situations were the following:

a. The situations represented stimuli or circumstances which, according to information obtained in earlier studies, were likely to be feared by a substantial proportion of children.

b. They were selected with a view to avoiding, as far as possible, the necessity of deliberately scaring the child (the aim, rather, was to observe his behavior when confronted with circumstances that might elicit fear but which he was free to cope with or to withdraw from as he chose).

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* Readers who desire to obtain more detailed information concerning the process by which the categories were devised and a detailed account of the classification of the fear situations are advised to see pp. 16–33 of the original report (7).

c. The situations were designed to be of such a nature that it would be possible to present them in substantially similar form to all the children involved in the study.

d. They were designed to make it possible to obtain an objective record of each child's behavior.

A brief description of the situations follows. All the experiments were conducted in rooms set aside for that purpose.

1. *Being Left Alone.*—When the child is seated at a table playing with a toy, the experimenter names a pretext for leaving the room (which until the time of the experiment was unfamiliar to the child). The experimenter remains outside the room for 2 min. The child's behavior is recorded by concealed observers.

2. *Sudden Displacement or Loss of Support.*—A bridgelike piece of apparatus, consisting of two boards laid end to end at a height of about 2 in. above the floor, was used. The first board is securely supported, but when the child steps onto the second board, which is supported only at the middle, it gives way and descends to the floor. (The situation did not strictly fulfill all the requirements mentioned above, but the procedure called for asking the child whether he voluntarily would walk on the board a second time.)

3. *Dark Room.*—While playing ball with the child, the experimenter seemingly inadvertently throws the ball into a dark passageway, 18 ft. long, leading from one corner of the room. The child is asked to retrieve the ball.

4. *Strange Person.*—While the child was temporarily withdrawn from the room an assistant, dressed in a long gray coat, a large black hat, and a veil that obscured her features, seated herself in one of the two chairs near the entrance. When the child returned his reactions were observed when he noticed the stranger and when he was asked to obtain toys placed near the stranger's chair.

5. *High Place* (possible danger of falling).—A board 12 in. wide, about 8 ft. long, and 2 in. thick, held firmly in place at the ends by two stationary ladders, was arranged at various heights from the ground and the child was asked to walk from one end of the board to the other to obtain a box of brightly colored toys. The board was first placed at a distance of 4 ft. from the floor; it was subsequently lowered if the child refused to walk across at this height and was raised if he performed at the 4-ft. level.

6. *Noise.*—An iron pipe 2 ft. in length and 2¼ in. in diameter, suspended from the ceiling in a corner of the room behind a screen, was struck a sharp blow with a hammer while the child and the experimenter were seated at a table containing toys. The child's response to this unexpected noise from an unseen source was first observed and then, pointing to the screen, the experimenter asked the child to "Go and see what made that noise."

7. *Snake.*—The snake, a harmless garter snake 22½ in. long (later replaced by a harmless ribbon snake, 24 in. long, which closely resembled the garter snake) was placed in a box deep enough so that it could not immediately climb out when the top was removed. In the box was placed a small colored toy. The child's attention was directed to the box, the lid was uncovered, the child was allowed to look in, if he raised any questions the experimenter simply said, "It is a snake," and then pointed to the toy and asked the child to reach in and get the toy.

8. *Large Dog.*—While the child was seated at a table containing toys a large collie dog was brought into the room on a leash by a familiar person. The dog was led to a certain point in the room and, after preliminary comment by the experimenter, the child was asked to go and pat the dog.

A small number of children were similarly exposed to a small dog. As it turned out, this little mongrel was livelier and more fear-provoking than the collie. This situation was discontinued early in the study by reason of the accidental death of the little dog while off duty.

A horned toad about 5 in. in length, rather ugly in appearance according to adult standards, was presented in the same manner as the snake described above. The use of this creature was discontinued when it appeared that most of the children were unaffected by it.

In a supplementary experiment, features designed to intensify the fear stimulus were added to some of these situations. The insecurely supported board was raised to a height of 4 in. A groaning sound, issuing from the dark, was added to the dark-room situation. The "strange person" suddenly stood up as the child entered the room. The noise stimulus was intensified by repeated hammer blows.

Safeguards.—Various measures were taken to guard against complicating factors such as (*a*) resistant behavior; (*b*) possible carryover of fear from one situation to another; (*c*) the occurrence of conditioned fears against the experimenter or the experimental room. The investigator established friendly contacts with each child prior to the experiment, and when the experiment was under way, periods of play, with attractive toys, were interspersed between the fear situations. As a general rule, four of the situations were presented on one day and the rest on a later day.

Method of Recording.—Much preliminary experimentation was devoted to the task of devising a means of recording the children's behavior in such a manner that the items of behavior that were likely to be exhibited could be defined in objective terms and be recorded in such a way as to yield quantitative scores. When the experiments were begun the observers utilized blanks that were devised especially for each experimental situation. These blanks contained a list of well-defined responses which the observer could check if any of them occurred; the blank also provided space for recording items of behavior that were not included on the check list, as well as for snatches of conversation. The observer used a system of numbering to indicate the order in which various responses shown by the child occurred.

Reliability of the Observers and the Method of Recording.—In order to check the reliability of the observer and the method of recording, use was made of the procedure of having two workers simultaneously but independently observe and record the same behavior. Two hundred and three such records were obtained. The data obtained by the two observers were then compared item by item and also in terms of the method of scoring that eventually was applied (see below). When an analysis was made in terms of the specific items of behavior that were recorded (*e.g.*, runs off, cries, clings to observer), the independent observers agreed to the extent of 84 per cent. When comparisons were made in terms of the larger categories according to which the specific items of behavior were classified (as described under "Methods of Analysis and Scoring" below), the independent observers agreed to the extent of 91 per cent.

Directions Used by Experimenter.—The experimenter took pains to use similar techniques in her dealings with the children in each of the situations where the child was asked to perform. These directions fell into three general categories: (*a*) a *simple request* that the child perform a certain act such as to go and pat the dog; (*b*) if the child did not respond, the experimenter proceeded to use a further approach consisting of various forms of *urging* and *reassuring;* (*c*) if the child, after urging and reassurance, still failed to respond, the experimenter *offered to accompany* him.

Methods of Analysis and Scoring.—In order to make it possible to treat the data in a quantitative manner the records of the behavior of the children were analyzed in terms of five categories, as follows (except in the case of *being left alone*, for which equivalent categories were devised):

a. Performs without hesitation. Without delay or intervening behavior the child directly and seemingly quite willingly deals with the situation, such as going alone to explore the source of the sound.

b. Performs alone but after some intervening behavior or delay (between the time when the child appeared to understand the direction and his movement toward entering into the situation), such intervening behavior taking the form of apparent temporary hesitation or caution rather than apprehension or fear.

c. Performs alone but after some intervening behavior which seemed to denote a degree of apprehension or fear as distinguished from caution (such as stopping while en route, reaching for or temporarily clinging to the observer, etc.).

d. Finally performs but only when accompanied or aided by the experimenter after preceding refusal; withdrawal and verbal protest when asked to perform alone.

e. Complete refusal to perform even though the experimenter offers to accompany and to help him (or, in the situations that involved being left alone in the room, attempts to leave room or attempts to follow observer plus verbal protests or crying).

According to one procedure, it was possible to assign a numerical "fear score" to each of these categories ranging from 0 (performs immediately without hesitation) to 4 (complete refusal to perform). According to another procedure, it was possible arbitrarily to designate behavior falling in categories *d* or *e* as definitely representing *fear* as distinguished from the behavior shown in the other categories. (The percentage of children who showed fear was somewhat larger when children who showed behavior falling under category *c* were added to those whose behavior fell in categories *d* and *e*, but the relative frequencies remained substantially the same.)

Experimental Study of a Method of Overcoming Fear.—This study (5), designed to provide information concerning the effectiveness of a method of overcoming fear in young children, was an outgrowth of findings obtained in earlier nonexperimental studies in this series of investigations (8). These earlier findings indicated that the most helpful procedure consisted in aiding and encouraging the child to learn various practical ways of coping actively with situations that he feared.

Subjects and Procedure.—Nineteen children representing the enrollment of a private nursery school, ranging in age from thirty-nine to fifty-four months, served as subjects. The first step was to discover the existence of fears that might be eliminated under experimental conditions. Two situations were used, representing the dark and a high place (or possible danger of falling). Fourteen of the nineteen children showed fear of the dark room (one of these later was withdrawn leaving thirteen). Two of the children showed fear of the high place. The children who thus showed fear were the subjects in the experimental study proper.

Findings

Findings will be presented in the following order: age trends in children's fears; fear as related to sex and intelligence in early childhood; factors in a child's everyday experience that contribute to his susceptibility to fear; factors in overcoming children's fears.*

Age Trends.—The findings showed definite age trends in children's fears. Before noting these in greater detail, two points should be emphasized. First, at all age levels it was apparent that children differ decidedly in their susceptibility to fear. Second, at any age level, in the case of the *same* child, the circumstances that elicit fear are likely to be quite complex. A given noise, for example, may provoke no fear if the child is with a familiar adult or is already engaged in noisy horseplay; but a similar noise may elicit fear in a different setting (such as when the child is in the company of an unfamiliar person or if he is suddenly startled). Accordingly, when it is noted below that a large proportion of children's fears at a given age level are shown in response to noise, for example, or in response to something that is new or unfamiliar to the child's experience, it does not necessarily mean that the fears in question can be accounted for solely in terms of noise or unfamiliarity as such. It does mean, however, that these features, as far as could be ascertained, were predominant in the total situation that confronted the child when he was afraid.

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* This summary deals only with selected aspects of the various studies. Readers who are interested in a more complete statement of findings should consult the original publications.

TABLE 1.—PERCENTAGE OF CHILDREN AT YEARLY AGE LEVELS WHO SHOWED FEAR IN RESPONSE TO THE VARIOUS EXPERIMENTAL FEAR SITUATIONS*

Situation	Age in months							
	24–35		36–47		48–50		60–71	
	Number of children studied	Percentage showing fear	Number of children studied	Percentage showgin fear	Number of children studied	Percentage showing fear	Number of children studied	Percentage showing fear
I. Being left alone....	33	12.1	45	15.6	14	7.0	12	0
II. Falling boards.....	33	24.2	45	8.9	14	0	12	0
III. Dark room........	32	46.9	45	51.1	14	35.7	13	0
IV. Strange person....	32	31.3	45	22.2	14	7.1	13	0
V. High boards.......	31	35.5	45	35.6	14	7.1	13	0
VI. Loud sound.......	31	22.6	45	20.0	14	14.3	13	0
VII. Snake............	23	34.8	36	55.6	14	42.9	13	30.8
VIII. Large dog.........	21	61.9	28	42.9	7	42.9	0	0
Total†..........	236	32.0	334	30.2	105	18.1	89	4.5

* From Holmes (4), with permission.
† Cumulative total of exposures, not children.

Fears in Infancy.—In early infancy, according to the observations of parents who kept records for periods of 21 days, fears are exhibited primarily in response to (*a*) intense or sudden stimuli that impinge directly upon the individual, (*b*) unexpected happenings, and (*c*) events which a child is able to recognize as new or unfamiliar but with which he has not yet learned to cope.

During the first year of life the fears that were observed were shown preponderantly in response to noises and events previously associated with noise, falling or displacement, sudden or unexpected movements, lights and flashes, persons or objects previously associated with pain, animals, and strange persons, objects, or situations. Fears in response to these latter situations appear when the child has achieved some measure of ability to notice differences between objects and persons in his environment and some ability to discriminate between familiar and unfamiliar events.

During the second year a large proportion of children's fears continued to be exhibited in response to noises, strange events, and falling or danger of falling. There was a decline in fear of sudden unexpected movements and of lights, flashes, and reflections. There was a slight increase in fear of animals

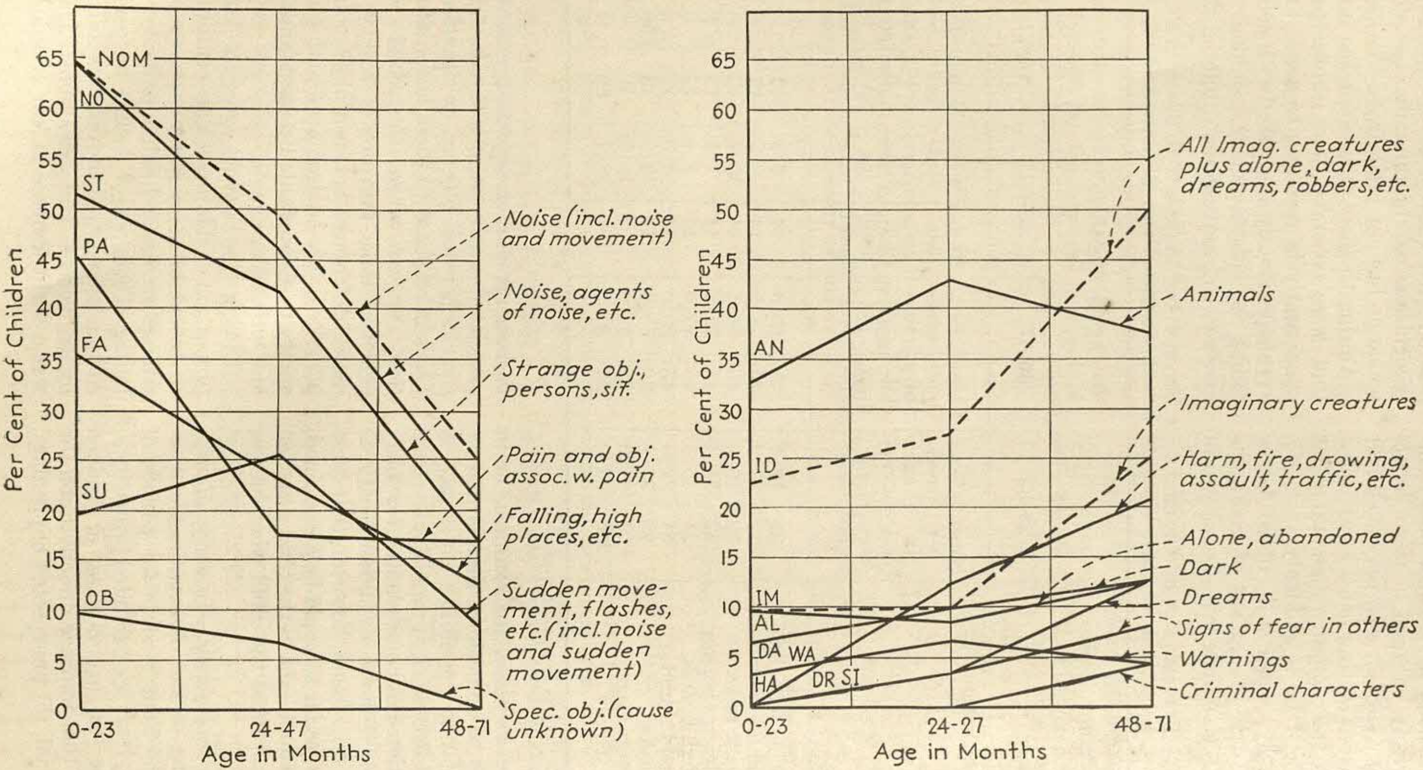

FIG. 1.—Percentage of children at biyearly age levels, showing one or more fears in response to various situations. See accompanying key for description of categories. This figure is based upon 21-day records kept by parents, including 31, 91, and 24 cases at the respective age levels. (*Adapted from Jersild and Holmes, Children's fears. Child Develpm. Monogr.*, 1935, *No.* 20, p. 358.)

and of objects or persons previously associated with pain. During the second year some children exhibited fears of the dark and of being left alone that were not exhibited during the first year.

Fears in the Age Range from Two to Six Years.—Some of the major trends with respect to the situations in response to which fear is shown at various age levels from two to six years are shown in abridged form in Fig. 1 and Table 1.

It can be noted from Table 1, which is based on findings in the experimental study, that there was a marked decline with age in the percentage of children who showed fear in response to each of the eight experimental situations, with the exception of the snake. This decline was not a regular one, however. The three-year-olds did not find the falling board so menacing as did the younger children, but they were, if anything, more responsive than the two-year-olds to potential or imaginary danger involved in being left alone, going into a dark room alone, mounting a high place, and dealing with a snake.

From an examination of Fig. 1 (which is based upon 21-day records kept by parents) and the results of the experimental study as shown in Table 1, it is possible to compare findings in the two studies. Both studies show a decline in frequency of fear of noise, falling, and strange persons. There is a high degree of similarity in the trends shown with respect to fear of animals. Findings in the two studies differ with respect to the percentage of older children who showed fear of the dark and of being alone. However, in a supplement to the experimental study it was found that when a groaning noise at the end of the dark passage-

Key to Figure 1

No.	Noise, proximate or remote, mechanical or vocal, and agents or objects associated with noise.
Nom.	Total noise (as in *No.*) plus noise combined with movement.
St.	Strange, unfamiliar objects, persons or situations; queer, deformed, or ancient persons; also unfamiliar variations connected with otherwise familiar (and non-feared) objects or persons.
Pa.	Painful objects, persons, situations, including also medical situations, objects, persons, or events inflicting or associated with infliction of a specific experience of pain, corporal punishment, or tactual shock.
Fa.	Falling, loss of support, danger of falling, high or insecure places, or events associated with falling or danger of loss of support.
Ob.	Specific objects or situations, not described as strange or associated with noise, pain, falling, or other events; reason for fear not indicated.
Su.	Sudden, rapid, or unexpected movement, plus flashes, reflections, sudden disappearance of persons; also, fear of events combining noise and sudden, rapid, or unexpected motion (overlaps *Nom.*).
An.	Animals, active or inactive, aggressive or passive (not including imaginary animals).
Da.	The dark or being alone in dark (apart from mention of imaginary creatures in the dark).
Al.	Being alone or abandoned (apart from mention of dark or imaginary creatures).
Im.	Imaginary creatures, mentioned in connection with or apart from the factors of darkness or being alone.
Wa.	Fear of events in response to verbal warnings by others.
Ha.	Fear in response to real or imagined harm that might befall, danger of bodily injury or assault (apart from noise, falling, and specific infliction of pain): drowning, fire, traffic accidents, being shot, assaulted, abducted, imprisoned.
Si.	Fear shown following, but not before, the exhibition of signs of fear in others.
Cc.	Criminal characters, robbers, kidnappers, etc. (not actually encountered).
Dr.	Fears arising during dreams, as revealed by the child through outcries during sleep and explanations upon awakening.
I.D.	Total imaginary or anticipatory dangers, including *Da.*, *Al.*, *Im.*, *Dr.*, *Cc.*, and items in *Ha.* not traceable to an actual happening or threat.

way was added to the dark-room situation, 14, or 78 per cent, of 18 previously unafraid children now showed fear. On the other hand, of 28 children who had previously shown no fear when exposed to a strange person, only 1 showed fear on a later occasion when the strange person suddenly stood up as the child entered. Only 3 of 28 children showed fear when the sound stimulus was intensified and prolonged. Only 1 of 29 children showed fear when the falling-board stimulus was intensified by doubling the height of the fall. Although these means that were used to intensify the fear stimulus were not, of course, equivalent in the different experimental situations, it still is noteworthy that the variations in connection with noise, falling, and a strange person had relatively little effect while variations in connection with darkness had a very marked effect.

As the child grows older, as his fund of experiences enlarges, and as his abilities increase, he acquires more and more competence in dealing with concrete events in such categories as noise, unfamiliar events in the everyday environment, and sudden movements. But with the widening of the child's range of activities, the expansion of his social contacts with persons within and outside the home, and the progressive development of his intellectual abilities, there is a widening in the range of circumstances involved in his fears.

With the development of the child's ability to carry on imaginative activities, to anticipate the future, to recognize *signs* of possible danger, even though the situation that confronts him does not present an imminent danger or demand an immediate adjustment, there is an increase in fears relating to imaginary or remote dangers and in fears relating to dangers that *might* befall. By the time children have reached the age of five or six years, according to the data obtained through 21-day records kept by parents, a large proportion of their fears are shown in response to the dark, being left alone, imaginary creatures, events occurring during dreams, and possible accidents or injuries. At about the age of six, likewise, some children report fears related to their personal prestige and achievement, expressed in the form of fear of possible ridicule, failure, and personal inadequacy. The increase with age in the relative frequency of fears in these categories does not mean, however, that children are completely immune to fright in response to more tangible events that disturbed them at an earlier time.

Fears at the Five- to Twelve-year Level. The fears of five- to twelve-year-old children as reported by themselves in private interviews showed many of the characteristics noted in the fears of the older preschool children who were observed by their parents. Fears of imaginary creatures, bogeys, and witches, of the dark, and of being alone represented about one-fifth of all the fears that were reported by five- to twelve-year-old children. Approximately 10 per cent of all fears dealt with criminal characters (robbers, kidnapers, etc.) apart from actual contact with such characters. These categories, plus reported fears of corpses and funereal matters, characters remembered from stories and pictures, and remote animals (such as lions, wolves) constituted 53 per cent of the fears reported by the children. Fears dealing with ostensibly imaginary, supernatural, or remote dangers showed a high frequency at all age levels from five to twelve but on a slightly declining scale (from about 63 per cent at five and six to about 48 per cent at eleven and twelve years).

Fears phrased in terms of more mundane circumstances, such as noises, heights, strange events, also were reported, but the number of fears reported in any one of these categories was low compared with fears of a more anticipatory or imaginary sort.

Apprehensions relating to practical issues in the everyday environment were, however, reported by a large proportion of the children when they were questioned by means of a check-list procedure. More than four-fifths of 1,124 fifth- and sixth-grade children reported, for example, when directly questioned, that they sometimes or often "worried" about failing a test; more than two-thirds of them reported worries about the possibility of having a poor report card; and two-fifths of them sometimes or often worried about being hit by rough children.

The findings from all approaches that were made in the study of children of elementary-school age showed that apprehensions concerning the *possibility* of troubles of various kinds far exceed the *probability* of such troubles or the frequency of their *actual occurrence*. For example, of 1,124 pupils, most of whom were superior to the average of the school population, 196 reported that they *often* worried about "being left back in school," and 801 reported that they *sometimes* or *often* worried about this matter. Actually, according to the promotion practices in the schools involved, it is likely that less than 1 per cent of the total, or, at most, not more than 11 of these children were in any danger of nonpromotion. Again, the first fear mentioned by 18 per cent of the children who were interviewed was fear of being attacked by animals; as against this, in response to other questions, less than 2 per cent of the children reported that they had been attacked by animals.*

Childhood Fears as Reported by Adults.—The reports of fears recalled from childhood by adults correspond quite closely to fears as reported by children themselves at the eleven- and twelve-year level, and less closely to the fears reported by five- and six-year-old children or fears reported by parents who observed children in the age range from birth to six years. Some comparisons are shown in Table 2. In the adult reports there was a high proportion of fears of animals, accidents and possible bodily injury, being alone or in the dark, and imaginary creatures connected with solitude or darkness. Adults in retrospect reported a substantially larger proportion of fears relating to ridicule, failure, and personal inadequacies than did children themselves.

Relation of Fear in the Experimental Situation to Age and Sex. *Fear and Intelligence.*—There was a positive correlation between fear scores and intelligence (a correlation of .30 between I.Q. and quantitative fear scores) in response to the eight experimental situations in the case of 51 children for whom similar intelligence ratings were available. This correlation was higher at the younger level (a coefficient of .53 at the twenty-four to thirty-five months range) and declined to almost .00 by the age of five. This finding is not out of keeping with findings from other studies which indicate that fear in response to certain situations is related to the maturation of intellectual abilities. A bright young child may perceive possible danger in certain situations which are not, as yet, feared by less intelligent children of the same age.

Sex Differences.—In almost every experimental situation the number and percentage of girls who showed fear was found to be higher than the number and percentage of boys. When comparisons were made between 29 boys and girls who were matched with

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* It is true, of course, that many of the fears of younger children and of older persons, likewise, are out of proportion to the dangers that threaten them. Moreover, it is also true that the presence of fear of a certain danger might lead to activities which enable the child to avoid or overcome the dangers. The discrepancy between what is feared and what is likely to happen still is noteworthy.

TABLE 2.—RELATIVE FREQUENCY OF VARIOUS FEARS*

	Fears recorded by adults from observations of children†		Fears reported by children who were interviewed†		Fears reported by adults when asked to record their childhood fears†
	All subjects: 0–71 months	Children aged 48–71 months	All subjects: 5–12 years	Children aged 11–12 years	All adults
Number of subjects	263	47	398	99	303
Number of fears reported	953	127	886	208	1,112
I. Animals; including animals actually encountered in the case of observed children, and these as well as remote animals in the case of older subjects who reported themselves	15.1	17.3	20.4	13.5	18.8
II. Specific objects and situations; cause unknown	1.7	0.78	0.45	0	1.1
III–VII. Sudden, unexpected movements, rapidly approaching objects, lights, shadows, reflections, lightning	7.1	3.1	2.4	2.9	1.6
VIII. Noises and agents of noise; objects associated with noise (not including fear of sudden motion plus noise)*	20.3	9.4	3.4	2.9	3.1
VIII*a*. Noises and gestures deliberately made to frighten	0	0	5.2	5.3	0
IX. Falling, loss of support, danger of falling, high places	8.3	4.7	1.4	2.4	4.8
X. Pain, including persons inflicting specific painful stimulation, objects, and events associated with pain, also medical treatment and medical situation, and objects associated with tactual shock	10.0	8.7	3.0	4.3	5.6
XI. Strange objects and situations	8.1	3.9	0.22	0.48	1.3
XII. Strange persons, unfamiliar variations connected with familiar persons, also queer, deformed, ancient persons, masked persons	11.3	3.9	2.5	1.4	3.2
XIII. Danger or threat of bodily injury through acts of persons or through situations regarded as dangerous (distinct from falling, noise, or specific pain stimulation); fighting, confinement, fire, dangers of traffic, drowning, etc.	3.7	14.2	11.5	14.4	17.2

* Including comparisons between (1) data submitted by parents who kept records for 21 days of the fears of children, and additional data reported by other adults who kept occasional records; (2) data obtained through interviews with 398 children, aged five to twelve, who were asked to tell about their fears; and (3) data submitted by 303 adults who gave written anonymous reports of fears remembered from their childhood. The table also gives comparisons between the oldest group of children included in the reports submitted by adults and the oldest children included in the interview study. All entries represent percentages, obtained by dividing the number of fears in each class by the total number of fears reported, in the case of each group of subjects.

TABLE 2.—RELATIVE FREQUENCY OF VARIOUS FEARS.*—(*Continued*)

	Fears recorded by adults from observations of children†		Fears reported by children who were interviewed†		Fears reported by adults when asked to record their childhood fears†
	All subjects: 0–71 months	Children aged 48–71 months	All subjects: 5–12 years	Children aged 11–12 years	All adults
Number of subjects	263	47	398	99	303
Number of fears reported	953	127	886	208	1,112
XIV*a*. Fear due to warnings and warnings about specific persons described as harmful	0.73	0	0.11	0	0.26
XIV*b*. Apprehension over punishment for misconduct, fears due to unspecified disciplinary measures, fears due to apparent feelings of guilt	0.62	1.6	1.2	1.9	2.4
XV. Signs of fear in others	1.0	3.9	0.22	0	0
XVI. Loss of property	0.1	0	0.11	0.48	0
XIX*a*.* Dying, ill-health (in absence of actual malady or apart from mention of specific dangerous situation)	0.2	0	0.56	0.96	0.3
XXI*a*. Loss of relative through illness or death; being abandoned by parent	1.8	4.7	1.9	2.9	2.1
XVIII. Ridicule, failure, apprehensive over personal appearance, personal inadequacies (present or future); also fear of being presented to or of performing before other people	0	0	1.6	2.9	8.7
XVII. Dreams; events experienced in dreams, fear of dreaming	1.0	3.9	5.1	5.3	1.9
XIX*c*. Criminal characters (in absence of actual contacts): burglars, kidnapers, etc.	0.1	0.78	9.4	5.8	4.0
XIX*b*. Corpses, matters connected with death, funerals, etc.	0	0	2.1	1.4	2.2
XX–XXII (except XXI*a*). Being alone or in the dark; also imaginary creatures or dangers feared when alone or in the dark	6.4	12.6	7.9	13.0	12.9
XXIII. Imaginary creatures, supernatural creatures (apart from specific mention of being in dark or being alone)	2.2	6.3	11.1	5.3	5.0
XXIV. Characters met in or remembered from stories, movies, and the radio, and specifically referred to such sources	0	0	8.2	12.5	1.1

* See ftnts. on p. 340.

† The values represent a tally of all fears, whether the same child showed one or several fears of the same class (*e.g.*, fear of three specifically named groups of animals, such as dogs, horses, cats, received a tally of three).

From Jersild and Holmes (2), with permission. The order of the entries has been changed but the original Roman numbers have been retained.

respect to age, a statistically reliable difference, indicating that girls showed more fear than boys, was found. Girls were also described as tending to show more fear than the boys in the nursery-school environment when rated by nursery-school teachers.

Factors Which Contribute to the Development of Fear.—The following is a summary of some of the factors contributing to the arousal or persistence of fear, as revealed through records kept by parents and interviews with parents.

Many of the persisting fears that children exhibited could be traced directly to an actual frightening event, as when a child is frightened by the pounding of a radiator and later shows fear of the object when it is silent.

Many fears also appeared to be shown in response to situations that were immediately associated with a frightening event, as when a child, after being struck by an automobile, not only showed fear of oncoming automobiles but also was apprehensive about crossing the street even if there was no automobile in sight.

Other fears had their inception through a more devious process of association with an original frightening event. One child in the study, for example, suffered from nightmares following a traffic accident and following this for the first time exhibited fear of being alone in a dark room (9).

When a child already is frightened, whatever may be the original cause, he may show fright in response to happenings that normally would not affect him. Further, if a state of apprehension already is present, the child may formulate his fear in terms of an imaginary or anticipated danger, such as criminal characters, bogeys, or gorillas or other sinister circumstances which he has encountered in his experience or in connection with his reading or pictures that he has seen. The child's tendency to be afraid or to fix upon this or that condition as something to be feared can be aggravated by the cumulative effect of setbacks or difficulties in his everyday life, such as difficulties in schoolwork, threats and punishments administered by his elders, problems arising in his relations with his parents and with other children, including, among other matters, competition with other children for the affection of his elders.

Findings Concerning the Overcoming of Fear.—According to information provided by parents in response to interviews, the most effective means of aiding a child to overcome fear is to help him, by degrees, to become more competent and skillful in coping with the thing or situation that he fears and to enter into active dealings with it. This procedure cannot so readily be applied, of course, in the case of apprehensions of an obscure nature, but, interestingly enough, it was found to be effective in some instances in dealing with fears of imaginary dangers (such as fear of an imaginary dog). If the procedure is to be effective it is important that the adult should try, as far as possible, to understand the background of the child's apprehensions and that he should be sympathetic in his approach. Methods involving a somewhat passive approach (such as verbal explanations and reassurances) were found to be ineffective in a large proportion of instances unless they were supplemented by more active techniques. Techniques that proved to be generally quite ineffective included coercion, ridicule, ignoring, offering palliatives for the child's symptoms of fear.*

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* Space does not permit a discussion of methods used by children themselves or of findings concerning fears that were "outgrown" as distinguished from fears, which, according to adults who participated in the study, persisted into adult years.

The procedure of helping the child to acquire competence in coping directly with a feared situation was applied, under experimental conditions, to two children who originally showed fear of walking across a raised board. After eight sessions, on as many different days, one of the two children (a girl aged thirty-nine months) cheerfully (and rather triumphantly) walked the distance of the board at an elevation of 6 ft. She subsequently walked at the same elevation when the apparatus was removed to the playground.

The behavior of the second of the two children (a boy aged fifty-one months) emphasizes the fact that the success of this method will be influenced by other emotional complications that may be associated with fear. During the first two exposures this boy seemed to make no progress (he continued to clutch, to say, "No, I can't," "I want to crawl"). On later exposures (during some of which the experimenter supplemented her methods by the use of the example of a fearless child) he made some progress, but then he relapsed, so that at the eleventh session (near the end of the nursery-school year, when the experiment was discontinued) his behavior was much the same as on the first day of the experiment. In his response to the experimental situation, the boy exhibited behavior that did not appear to arise solely from fear of the apparatus as such, but which was characteristic of his behavior in a variety of other situations in the general nursery-school environment, including a display of "babyish behavior," appeals for help, and efforts to attract attention from adults. His relapse also coincided in time with other emotional problems exhibited by the child in the home environment.

The procedure of helping the child to acquire competence proved to be successful in each case when applied to 13 children who originally were afraid to enter a dark room. After from three to seven exposures (on as many different days) all the children unhesitatingly, and apparently without fear, entered the dark room, groped their way to a light at the far end of the room, turned on the light, and retrieved a ball.

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CHAPTER XX

SOCIAL BEHAVIOR AND CHILD PERSONALITY*

LOIS BARCLAY MURPHY

The Approach and Methods Used to Study Sympathetic Behavior

Sympathy, when it is sensible and genuine, not merely a projection of the sympathizer's anxiety or a way of dominating others, is intimately connected with all the other responses of a friendly and constructive nature that are the foundation of a cooperative society. It appears in very young children; yet it has scarcely been studied at all. We have almost no scientific material even on such questions as the age at which children sympathize in different ways, and none at all on the cultural or personality factors that are tied up with different sorts of sympathetic behavior.

The focal point which we have selected is the analysis of children's responses to distress in other children; its periphery, however, extends into areas of cooperation and friendly responses of varied sorts—responses which the reader may consider to be continuous with, and related to, the sympathetic responses we have adopted for primary study.

Preliminary observations were made from January to May, 1933, on Group *P*; the techniques for the collection of material and the plan for the main body of the study were worked out during this time. The following year, Groups *H* and *W* were observed intensively from October to May. A large proportion of the parents of children in these groups were connected with a university as students or teachers, and most of them lived in the neighborhood of the university in New York City.

Several other groups were observed for shorter periods. Most important of these was Group *M*, which was composed of three-year-old day-nursery children, who came from families of lower socioeconomic status.

The observers were present for the 2-hr. play period of the morning. Observations were made on Groups *W* and *H* for 94 and 117 days, respectively, making a total of 432 hours of observation of these two groups.

Since it was not possible for observers to be present every day, or all day, it seemed desirable to obtain the teachers' checks on an inventory of social responses, based upon the observations. This made possible another approach to the usual analysis of differences related to age, sex, and other characteristics and afforded a criterion of reliability of the observations of total situations on the playground.

This inventory was based on the concrete behavior items which appeared in the observations during the preliminary period; it was rated on a five-point scale by the teachers twice a year. In addition to a sympathy scale, a number of items relating to cooperation, imitation, and aggressiveness were included, together with a number of other trait descriptions designed to furnish additional material for analysis of personality relationships.

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* From MURPHY, LOIS B. Social behavior and child personality. New York: Columbia University Press, 1937. Pp. viii + 344. Adapted with permission.

Experiments, using animals, children, pictures, stories, etc., added variety to the range of situations in which the children were observed. This was further extended through data collected from the parents in 1-hr. interviews. These interviews followed a schedule, which asked questions regarding the child's behavior and factors in the home which might influence it.

The World of Adults

Visitors from other cultures might comment on many experiences which contribute to and interfere with the development of sympathy in this culture. On the one hand, parents who love their children sometimes attack them with their hands as in "spanking," or, in some groups, with other instruments, such as straps, brushes, etc. Big boys attack little ones in annoying, though not necessarily physically harmful, ways known as "teasing"; older sisters nag younger ones. The aggression of children against adults, since they have no accepted forms of attack upon adults, takes the form of a disorganized aggressive outburst against nothing in particular, called a "temper tantrum," in which the child kicks the floor, screaming, doing no physical damage to anyone but himself, but causing considerable annoyance to the adults. The aggression of adults takes various forms, from spanking to polite and inexorable control of the child's resources when he does not comply with the wishes of the adult. This aggression of the adult is usually justified with the concept of the "necessary authority" of the adult. Some observers see this aggression as related to other forms of aggression, such as war. Aggression within a geographical group takes the form of plundering property by special groups of outlaws called "gangsters." Along with all this conflict between age groups, economic groups, and geographical groups, there is also a great deal of friendliness and devotion. Parents give up many things they want, for the sake of their children; individuals that have wealth sometimes share it with people who have little; children make, at great cost of energy and time, gifts for their parents on special occasions; and when a drought brings famine to one nation, people of another collect food for the hungry strangers. Women of two fighting nations may care for the wounded or the children of their enemies.

Both the paradoxes and the consistencies in this culture are aspects of the fundamental nature of this society, of its competitive individualism. Here lie the roots of both the drive for power and the obligation to pity; the conflicts between economic, intellectual, sexual, and age groups, and the cohesive forces that hold groups together.

Family Patterns.—Most of the children in Groups *H* and *W* were alone in a family of adults, or at best had one brother or sister, usually within three years of his own age. This frequently meant no play with other children outside of the nursery school, and little opportunity for a variety of relationships with children of different ages. It was characteristic for the children to be cared for by more than one person at different times of the day or week. A large proportion of the mothers were contributing to the support of the family by part- or full-time work away from home, so that their time with the child was limited in general to less than 5 hr. a day. In a few cases the care of the child was shared chiefly with his father, or with an older sister, aunt, or grandmother. In a few cases, the full-time occupation of the mother away from home, when the father was unemployed, meant that the child was principally in the care of his father.

In general, the fathers are professional men; most of them were in their thirties and in the process of getting professionally established. The salary range for the father was from zero to $12,500, with a median of $4,000.

Although the socioeconomic status was important in determining the physical adequacy of the home, it was by no means directly correlated with the educational stimulus which the children received. One little boy, whose mother was divorced and studying for her professional degree, keeping him in nursery school with the money she earned during the summer as governess for another child, had a wider range of experiences during the year than any other child. This child went with his mother every Saturday or Sunday to a zoo, an aquarium, the docks, a museum, the big bridges or the parks.

Some parents believed that one way to combat the pattern of war in Western civilization is to teach their children to hate it, on the one hand, and to keep their growing interests in channels that do not contain either weapons of war or ideas of it on a miniature level. But they were forced to face for their children the possible disintegrating effects of maintaining an inflexible opposition to the patterns of school and street play. For the children take over quite simply and with unrepressed gusto the techniques of conflict in their culture—from popguns to pistols, shotguns, and machine guns.

Emotional Attitudes in the Family.—Intimately associated with the influences of metropolitan life were patterns of feminine behavior which even these mothers could not wholly escape and which were important factors in the emotional atmosphere in which children were growing up. This was the period when the sophisticated woman took the place of the insouciant flapper. The smart woman had little capacity for the poignant creativeness of maternity in a confused modern world, a world where few could see beyond the fence of depression which bounded all acres. All the intimacies of personal guidance and direction became professionalized, with vocational guidance and marriage clinics as well as parent education. This professionalization of personal relations, with its accompanying emphasis upon objectivity, meant for some time a neglect of the fundamental affective roots of these relations. It was a period oblivious to the force of sentiment, when emotion was apt to be viewed with suspicion and objectivity was a value that for a time seemed to exclude love. Affectionate embraces were rare accompaniments of the departure of parents in Groups *W* and *H*. This was one of the most striking differences between these mothers and the mothers of the day-nursery children of the lower socioeconomic group, which was less touched by either the fashionable values of smartness or the dominant emphasis at that time against giving the child "too much attention."

The quality of the relation between parents and children had other aspects of importance for the emotional development of the children. Overt aggression of the old-fashioned sort, such as spanking, was taboo, yet indirectly the aggression of the adult toward the child was never more inexorable. Routine was emphasized in all child-care literature and created for many parents of anxious zeal a new standard of adequacy.

The ideal of objectivity influenced the choice of stories also. In the home of one child in Group *W*, the mother protested violently against the idea of letting the children hear either Mother Goose rhymes or fairy stories. Her child was allowed to read nothing but the most unemotional stories of children like himself, who got up in the morning and brushed their teeth and went for a walk in the park. At the other extreme of this range, we shall find another child in Group *W* (Lila),* whose father systematically accompanied her intellectually and emotionally on her excursions of curiosity. No pictures in the magazines, no subway advertisements, no funny papers were denied to her, and she was never hurried past any street episode which might give her an emotional shock.

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* All children are referred to by pseudonyms.

Between these two extremes of the completely protected child and the child who is encouraged to explore every new experience, we find the largest number of children. Most of them knew stories of children whose lives were much like their own. They knew some fairy stories, and these had usually been softened to prevent them from giving any emotional shock. In most cases where the child had been allowed to hear the story of Red Riding Hood, the Wolf was not described as eating up either Red Riding Hood or the grandmother.

Parents as a group were influenced to greater or less dependence upon the patterns recommended by the toothbrush and building-blocks school of present education, which has emphasized toilet habits and motor activity to the exclusion of emotional development. This trend, however, has had to work against a tradition of story and song and picture over which the parents have little control. Even when they succeed in keeping the child from contacts with Mother Goose rhymes and fairy stories or the pictures of everyday newspapers and magazines, they still cannot completely reorganize the contents of their own minds and their own attitudes. The stuff with which their minds were fed when they were young is still vital and appears in their conversation with their children in spite of themselves. The best they can do is to make compromises as well as may be and to soften the harshness of the old tales to suit the purposes of the modern trend.

Nursery-school Patterns.—The philosophy of the school in relation to children's acts on the playground was one of noninterference and of letting the child develop security through learning to initiate contacts with materials and with other children independently. This policy of noninterference was modified at several points. There was general agreement that the children should not be allowed to hurt one another physically, and there was sometimes considerable effort made to help the child to feel at home during the first hard weeks of his transition to the nursery school.

The philosophy of the playground was to some degree in contrast with the emphasis on routine forming of habits in bathroom, dining-room, and bedroom procedure. Furthermore, the teachers, like the parents, made verbal avowal of adherence to patterns differing from habits built into themselves, which more directly dominated their actual behavior. They believed in free play, yet a fifth of the "episodes" of Group *W*—which meant a large number of instances altogether—showed a teacher's participation or interference.

Teacher interference occurred most frequently in connection with conflicts which led to crying, such as arguments on property, and in these cases the teacher customarily defended the child who first had the toy or other object concerned. When the children got into a physical encounter, with fist fighting and pounding, scratching, or other vigorous attack methods, the teacher usually removed the child who was attacking at the time she came upon the scene, although if she had seen the beginning of the conflict and was aware of the child who started the fight, she reproved or took away that child.

When the object of the conflict permitted of cooperation, as in the case of long trains or rocking boats, some teachers suggested that the children share and helped them to see that there was room for both; while others followed characteristically the principle of "first come, first have."

Occasionally a general principle was enunciated: "You must not slap each other," or "We do not hit children in nursery school." At other times the teacher used specific negative suggestions, such as "Leave Tommy alone." Sometimes the immediate situation, with its destructive element, was ignored, and the teacher simply suggested another activity for the child or took him off for some ritual purpose such as drinking tomato juice or suggested a positive turn of activity by asking the child what he wanted to do.

When the attacked child appealed to the teacher for defense, the teacher frequently suggested that he talk to his aggressor himself. We find also the simple plan of removing the attacker from the situation; this appeared frequently in the case of Douglas, who stood high on all records for interference in situations between other children, and occurred where the attack was so frequent that discussion was of little or no use.

Sometimes the teacher suggested a solution which would fit the situation. This was apt to occur when the child left his toy to attend to a routine need and another child took it. The teacher here suggested that the second child could return it when the first came back.

Nearly every teacher, at one time or another, used such expressions as "That's not much to cry over"; "She didn't hurt you"; "You are all right—don't be a baby"; "Well, don't cry about it, talk." This was particularly apt to happen when the child appealed for sympathy. It also happened much more frequently in Group *W* than in Group *P* or Group *H*, during the period of our observation. It is interesting to note also that one teacher in Group *W* was recorded several times as laughing at children who were crying; this did not occur at any time in the other groups.

In all the groups we also found some teachers attempting to help children to understand situations that were unpleasant for other children or painful to them. "D. doesn't like that"; "J. is crying—that hurts"; "A. doesn't want you to do that"; "C., that hurt Lila."

In some situations, teachers in both groups responded directly to the child who was crying. In Group *W*, a teacher said "I'm sorry" when K. bumped his head; patted W. and rubbed his head when he fell and bumped his head; took Lila on her lap when Sally pinched her face; wiped Beulah's eyes when Agatha pushed her into the sandbox; took Douglas on her lap when he fell off his tricycle and hurt himself; stroked Arthur's head after Bernard pulled his hair.

In Group *H*, a teacher comforted Patrick when he cried while pulling Saul in the wagon; helped Patrick get out of a box that he was caught in; patted Gregory when he fell off the jumping board; took Davis for a walk to see a dog when he was hit in the face by the rocking boat and cried; wiped Stella's eyes when she cried the first day she was at school; soothed Dean when he bumped his chin; held Denison when he fell in the mud and cried.

This picture of the cultural setting, glimpsed as it is through small windows afforded by conferences with parents and by records of teachers' responses to the children, shows a confusing situation. The most stable characteristics of the culture appear to be contradictory in their strong aggressive and strong cooperative trends. But within this conflict are all the confusions arising from the fact that stability is found with certainty in no quarter. Children are going through the double process of experimenting with their own feelings and capacity to stimulate reactions in others, while they must make some adjustment to the codes and patterns imposed by adults. But almost every adult is a law unto himself, and all adults, virtually, are themselves in a state of flux—modifying ingrown ways of responding to bring them into conformity with newly formulated codes and succeeding in being neither wholly spontaneous nor wholly consistent with the philosophy expressed.

The children, then, have to handle themselves and the adults, too—to sift out what is really dependable and important from the confused array of verbal and behavior patterns which different adults present. The conflict in values, as the child absorbs them from the varied mediators of the broader culture and from the conscious emphases in home or school, is illustrated by a drawing made at five years by one of the children in this study, who was artistically and verbally precocious. The drawing shows a battlefield; horses and soldiers are lying about wounded and gory in the foreground, while slaughter with guns and arrows fills up the main body of the picture. At the top is carefully printed: "Not believed by the artist."

The World of Nursery-school Children

In all the groups, a child would occasionally put his arms around, or hug, another child without any direct stimulus. The freest and most frequent expressions of affection occurred in the lower economic group. Occasionally the children expressed verbally their appreciation for the achievements of other children; this form of social response is rare, however, among these groups—perhaps appreciation as a developed pattern waits for more explicit awareness of values, or more freedom from egocentric concerns, or even more definite dominance relations.

The children were frequently aware of who was present and who was absent and sometimes expressed pleasure when the absent child returned. Three-year-olds also noticed one another's clothes and routine; this was evidence of broadening social interest, as compared with the two-year-old level, where the children seldom made observations of this sort on other children.

Play.—If we look at the play patterns of the children as an indication of what the children are assimilating from their culture, we find a few outstanding interests predominating over a variety of miscellaneous ones. In a sample of about 300 episodes, the patterns which were most prominent were eating, playing mother and baby, doctoring the babies, shooting, and killing.

Mother-baby play was common in Group *W*, Group *H*, and Group *M*, along with eating and doctor play. Some patterns, however, both within these categories and without, occurred in Group *M* and not in the other groups; spanking the babies occurred in this group, while Group *W* and Group *H* confined themselves to feeding the babies, putting them to bed, and taking care of them when they were sick. Group *M* also included patterns of playing garbage man and bogeyman, which were not included in the other group. In the study of children's fears it was found that the Group *M* children showed fears of the bogeyman which were completely unknown to Groups *H* and *W*. There is more tendency in Group *M* to include some outgoing affectionate patterns between mothers and their imaginary babies than there is in either of the other groups. It would be interesting to make a comparison between the actual early experiences of perception and participation which a group of children go through and the selection and emphasis which appear in their play. From this material, it appears that the chief sources of play material are: (*a*) organic satisfaction of all sorts—eating, drinking, eliminating; (*b*) emotional experiences—being hugged, spanked, etc., and the need to feel a sense of power; (*c*) dramatic activities or problems—fixing a punctured tire or putting out a fire.

If one characteristic more than another impresses one who looks at these imaginary patterns for play, it is the amount of overlapping from one institution to another and the *striking* *prevalence of both aggressive and protective patterns in all the groups.* If this is also apparent in the more intensive quantitative study of sympathetic behavior presented here and if the child who is most ready to pick up one pattern is also most ready to pick up the other, it would lead us to expect that children who show a great deal of protective or maternal behavior would also show a considerable amount of aggression, by and large; *i.e.*, the more completely a child reflects this protecting-fighting culture, the more likely he will be to show both tendencies to a considerable degree.

Conflicts.—Conflicts appear in large numbers in all these groups of children. Conflicts over property, including snatching another child's toy, molesting or aggressively attacking another's toy, and arguing about property rights, are considerably greater among three-year-olds than conflicts in which an attack on the child's person is the starting point.

Group *W* has been found repeatedly, over different years when the constellation of the group was different, to show more conflicts than Group *P* or Group *H*. Among the differences in the circumstances in which the groups play, the following are worth noting:*

1. Group *W*, which has the greatest number of conflicts, has a much smaller play space in proportion to the number of children, which means that there is probably more physical contact imposed by the external situation than there is in the case of other groups.

2. There were more instances of interference by the teacher in Group *P*.

3. The age range of the children is different. In Group *P* this range was 20 months; it included children from twenty-eight to forty-eight months. In Group *H* the range was greater, nearly 24 months. In contrast with these groups, Group *W* included children only from thirty-seven to forty-seven months, at the end of the year, with an age range of 10 months. It seemed probable to the investigators that this difference in developmental ranges resulted in more competitive pressure among the children in the narrow age-range group than was characteristic of the other two groups; children closer in age would be more likely to want the same toys.

We have mentioned the enormous amount of conflict over property and materials and the techniques for defending the child who "had it first." Offering toys and sharing them also occurred, more frequently in Group *H* than in Group *W*, particularly among the children who were about four. In fact, the responses to distress situations which we have classified as sympathetic behavior, and which we shall discuss in the following sections, may be considered to be on a continuum which includes a variety of social behavior patterns, from the kind of cooperation that profits as well as gives, to protective responses that are oriented purely toward the needs of the other person.

Cooperation.—In Group *M*, where the children were from a lower economic group, there were many instances of children's taking the responsibility for or helping a child in routine situations or on the playground.

In all the groups, the swing activity characteristically stimulated cooperation, since few of the children could "pump" themselves in the swing adequately without being pushed.

Other activities which stimulated cooperation were playing in sandbox, playing with sleds or wagons, playing with materials for a house—tea sets, etc.—playing on the slide, or riding tricycles with footholds on the back for hangers-on.

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* This analysis is based chiefly on data collected for this study. The trends agree in general with those described by Jersild and Markey in their extended study (1).

Group Structure and Relationships between Individuals

Group *W*, which was observed only 188 hours, gives 195 unsympathetic responses, while Group *H* gives only 60 unsympathetic responses during 204 hours of observation. When allowance is made for the differences in children present during observations, Group *W* shows 2.4 times as much unsympathetic behavior as does Group *H*. The ratios of sympathetic to unsympathetic responses are 1.63 for Group *W* and 6.63 for Group *H*. This objective difference in the proportion of sympathetic to unsympathetic responses in Groups *H* and *W* accords with the impressions of the observers, who noted certain kinds of responses, such as laughing at another's distress, or egocentric remarks such as "I don't cry," occurring more often in Group *W*, as well as more frequent teasing and conflicts in Group *W* than in Group *H*.

The ages of the children in the two groups partly account for these differences. The *relation between the ages* of children in the two groups seems of most importance; it suggests that differences in the age ranges of the children and other special aspects of the group setup may affect the behavior of the group as a group. Group *H* consisted of two rather clear-cut groups of children, "the older ones," who came 5 days a week and some of whom stayed until 5 P.M., and "the babies," who generally came on Mondays, Wednesdays, and Fridays, for the morning only. The differences in age in Group *H* were great enough to avert constant competition for the same play materials and activities and to stimulate protective, "big-brother" types of response of older toward younger children. There may doubtless have been important imitative factors: when older children set examples of protective and sympathetic behavior, these would be copied by younger children when occasion offered. Group *W*, on the other hand, consisted entirely of three-year-olds. They were developmentally close enough together to be interested largely in the same materials and activities; this necessarily resulted in more competition and conflicts over these materials. And the same imitative factors that were present in Group *H* and which led younger children to pick up cooperative and helpful patterns from the older ones would result in acquisition of more techniques of conflict in Group *W*.

In this connection it is interesting to note that, for three successive years, groups occupying the present quarters of Group *W* had shown high conflict scores, as compared with groups in the quarters of Group *H*. It looks, further, as if the smaller amount of space (and of properties and play materials) put a heavier competitive pressure upon the children on the one hand and contributed to more frequent physical contact on the other hand, both of which might tend to increase conflicts and unsympathetic responses. These conflict and unsympathetic behavior scores might be a simple consequence of the greater likelihood of physical contact in the smaller play area, or they might be evidence of psychic tension created in children who were sensitive to the pressure of narrower quarters and the closeness of so many people.

Differences in teachers are important also. One of the teachers in Group *H* was outstandingly spontaneous, warm, responsive to the children, and at least one of the teachers in Group *W* had certain rather "hard-boiled" patterns, such as repeated laughing at a crying child. The positive effects of a happy adult who loved children were particularly striking in Group *H*.

Up to this point we have been considering only the data on sympathetic responses given. What relation is there between the number of responses given and the number of sympathetic responses received? The rank difference correlation between giving and receiving is −.06 for Group *W* and −.13 for Group *H*. When correlations were calculated separately for boys and girls, they were −.10 and −.06 for boys in Group *W* and *H* respectively; they were +.07 and −.50 for girls in Groups *W* and *H* respectively. In Group *H* there were only five girls, and two of these had almost the role of "pets" in the group. One of them, Joyce, who was also one of the youngest children in the group, was lowest on responses given and next to highest on responses received. In other words, there is little evidence of a stable relation between number of responses given and received, either for the group as a whole or for the sexes separately.

The sympathetic responses for the year are charted for groups *H* and *W* in Figs. 1 and 2. In each of these charts, arrows show the direction of the response. The relatively even distribution of sympathetic responses between girls and boys, and the tendency for certain children to be foci for radiation of sympathetic responses in many directions or, conversely, foci for collection of sympathetic responses can be seen. Children who distribute a few responses among many other children contrast with children who concentrate many responses on a few.

These charts make clear the differences in group structure between Group *W* and Group *H*. In Group *W*, practically all the children are actively involved in the group, although there are some relatively isolated children, like 9 and 13, who give almost no responses to other children and also receive few. Group *H*, on the contrary, shows a definite loading of activity among the older children; the younger ones form a periphery, with various degrees of aloofness from the group. Boys 4, 11, and 3 are involved in the group almost solely through other children's responses to them, while 9 and 2 show some responses to other children, in addition to a larger number of responses received. Some children, like 12 and 10 in Group *H*, are centers with radii of giving and receiving, involving a large number of children, while other children, like 14 in Group *H*, show responses which are comparatively concentrated toward one other child. In some cases, as with 2 in Group *H*, a child is a focus for receiving responses and gives but few; while another child, like 12, is primarily a focus from which responses are given.

The comparison of the numbers of sympathetic and unsympathetic responses which the various children received and gave is interesting in relation to other characteristics. Of three children who received more unsympathetic than sympathetic responses from other children (Geoffrey, Daniel, June), two had many records of crying; one of the three was among the top half of the group for good adjustment to the nursery school. It is interesting that one of these children gave no unsympathetic responses, while the others were about the middle of the group in this respect; and that all three were about equal and average for the number of sympathetic responses given. Out of six children who gave very few unsympathetic responses, three giving none at all, two were conspicuously out of the group, and the others were not among the top half of the group from the point of view of social contacts and social involvements. The children who gave large numbers of either sympathetic or unsympathetic responses were children who were customarily playing with other children.

The factor of frequency of contact, however, is not the only one suggested by the specific analysis, for we find that, in contrast to the children who receive more unsympathetic responses than sympathetic ones, certain children received many more sympathetic than unsympathetic responses. In the

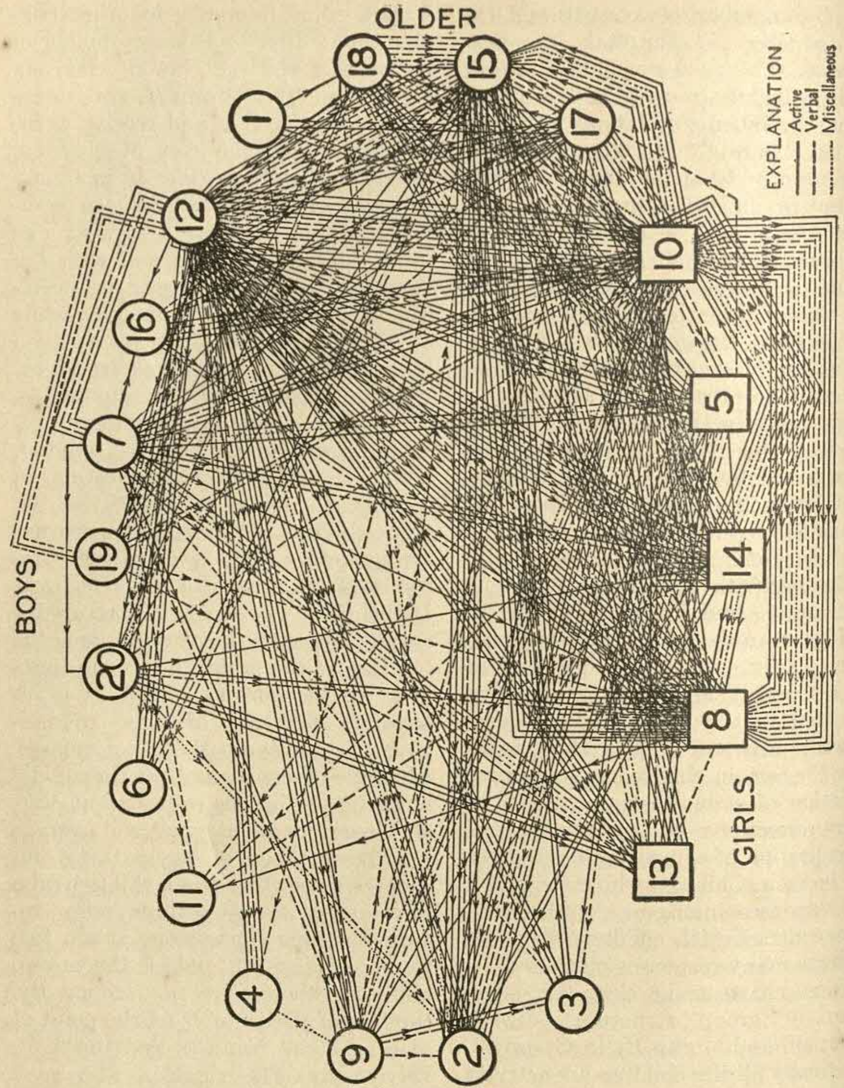
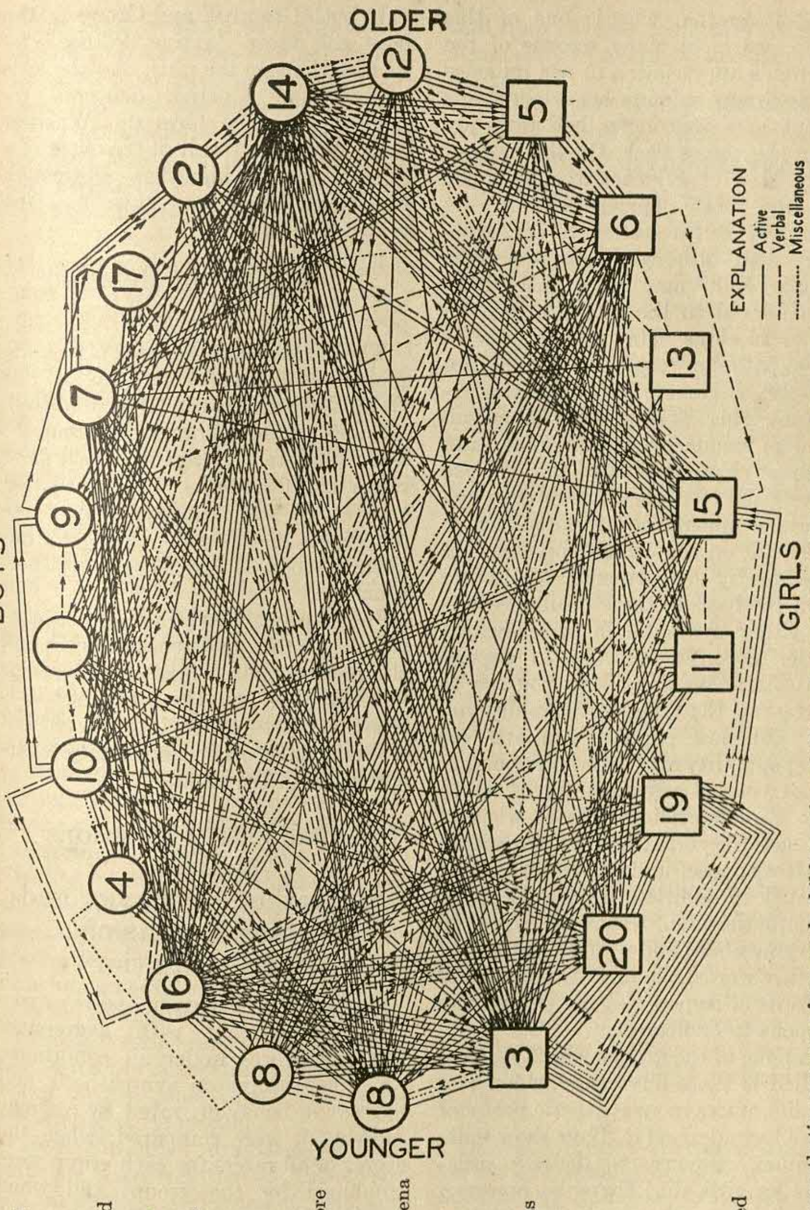


FIG. 1.—Sympathetic responses from each child to other children during 1933–1934 in Group *H.* (*From Murphy, Social behavior and child personality. New York: Columbia University Press,* 1937.)

1. Alex
2. Davis
3. Dean
4. Denison
5. Gwen
6. Gregory
7. Heinrich
8. Heidi
9. Holden
10. Janet
11. Jesse
12. Julius
13. Joyce
14. Lucinda
15. Patrick
16. Reinhardt
17. Seth
18. Saul
19. Sturgis



1. Geoffrey
2. Daniel
3. June
4. Bernard
5. Beulah
6. Agatha
7. Peter
8. Kirk
9. Theodore
10. Wallis
11. Philomena
12. Arthur
13. Elda
14. Douglas
15. Mary
16. Evan
17. Jude
18. Lila
19. Winifred
20. Nancy

Fig. 2.—Sympathetic responses from each child to other children during 1933–1934 in Group W. (*From Murphy, Social behavior and child personality. New York: Columbia University Press*, 1937.)

case of Agatha, who is one of this group, we have many records of the children's appreciation of her presence in the group, missing her when she is absent and welcoming her with joy when she comes back. On the basis of every kind of evidence available, she was the most popular child in the group. It is interesting to see, however, that, although being the most popular child may very likely have been related to the fact that she received twice as many sympathetic as unsympathetic responses, it did not entirely eliminate unsympathetic responses. This suggests that the unsympathetic responses were in some cases patterns characteristic of the children making the responses, rather than evidences of general negative reaction to the child; or they might be reactions called for by the particular situation.

On the basis of these results, receiving either sympathetic or unsympathetic responses appears to depend particularly on how close you are to the rest of the group, how loudly you cry, and how popular you are—for your popularity may determine whether or not you get any attention at all. It may also determine in part whether you get a sympathetic or unsympathetic response, and the latter will be affected, in addition, by the nature of the situation: *i.e.*, what you appear to be crying about and who is reacting, or, in other words, the most characteristic patterns of response of the person who happens to be nearest.

In none of the groups which we have studied is there any clear evidence of sex differences in sympathetic behavior as we have defined it. Boys show quite as much response to distress situations as girls do. There is, however, some evidence that boys show certain kinds of responses more frequently than girls and that they respond to somewhat different situations. For example, we find more boys "actively defending" a child who had been attacked.

In both Group *W* and Group *H*, the boys give more "active defense" responses than do the girls, and the girls receive more "active defense" responses than the boys do. Whether this is entirely a result of the effect of a culture which identifies aggression with masculinity we have not the evidence to say.

Intelligence in Relation to Sympathy

The correlation of sympathy responses with mental age was .47 for Group *H*, which, it will be remembered, included a wide age range. In Group *W*, where all the children were within a range of 10 months, the correlation was −.13, which suggests that age differences in this group were less important than other aspects of personality.

In all probability, intelligence contributes to the quality of responses and the insight upon which a response is dependent at any age level, but it is secondary to the social interest, responsiveness, and other personality characteristics of the child.

Quantitative Relations between Sympathetic Behavior and Other Aspects of Social Behavior

Sympathetic-behavior scores correlated positively with aggressive-behavior scores under all conditions, *i.e.*, when scores on sympathetic and aggressive behavior, rated by a single individual, were compared; when the scores of all raters for each group were combined for the group; and when combined ratings (of all raters) for each child in all three groups, pooled, were used. For example, sympathy and aggression scores for Group *H* correlate to the extent of .33; with chronological age constant the correlation is .27.

An item analysis of relationships, both within the scales and between the scales, is even more interesting than a comparison of the scales as a whole. The most dramatic relationship which appears here is a correlation of .91 between Item 4 (joins attack on one child by another) and Item 10 (defends child attacked by another). Item 25 (attempts to comfort another child with pats, embraces, and the like) gives a correlation of .58 with Item 19 (pushes or pulls another child without regard for his discomfort). Item 44 (helps child out of painful situation) gives a correlation of .27 with Item 7 (pummels child who falls accidentally). When these item relationships are calculated for the three pooled groups, the correlations just given are .69, .34, and .36, respectively. In other words, the aggressive and sympathetic uses to which certain techniques of physical contact are put may be less important in some cases than the techniques themselves. The child may use his fists to defend himself in one situation or to defend someone else in another situation; a grasp may be aggressive or affectionate, all depending on the circumstances. It remains to be seen whether these "techniques" are simply specific "habits," with little relation to the child's personality, or whether they are generally, or, in some cases, dependent upon a basic "style" of social response or a fundamental personality need.

When comparisons are made between whole aggression scales on the one hand and items of cooperation or sympathy scales on the other hand, the results are almost as interesting.

Here the most dramatic relationships are the correlation of .55 between the rating on the aggression scale as a whole and Item 25 (attempts to comfort another child with pats, embraces, and the like); the correlation of .30 between the aggression scale and Item 3 of the sympathy scale (defend rights of smaller child); and the same correlation of .30 between aggression scale and Item 10 of the sympathy scale (defends child attacked by another).

Variations in Sympathetic Behavior in Relation to Motivation on the Playground

The agreement of raters with one another that a child is outstandingly sympathetic does not prove that a child who is found to be outstandingly sympathetic will actually be sympathetic on every occasion that sympathy is called for, or even on *most* occasions that sympathy is called for; nor does the agreement of combined ratings with objective observational records, nor the internal consistency of a large series of items of sympathetic behavior. A child may be extremely sympathetic one day in one group and very aggressive the next day with a different combination of children. Our records show a wide variety of combinations of behavior—some children (Janet, Kenneth, Heidi) were relatively free from aggression of any sort, while others (Alfred, Julius, Patrick, Reinhardt, Philomena) were not merely aggressive but mean on occasion.

In a culture so complex as this, similar behavior may appear with quite different meanings, depending upon the total orientation of the child. Children like Sturgis and Janet, who were almost invariably sympathetic to other children's wishes and distress so long as no conflict with their own needs was involved, would, however, defend their own play arrangements or property when another child interfered with these.

One of the most interesting illustrations of the possibility of a quick shift of attitude and expression in reaction to a shift in ego status appeared in a sad drama of hurt egos, where Janet's usual consistent friendliness and sympathy turned to aggressive retaliation, after she felt she had been intentionally injured by Heidi, one of her closest friends.

Heidi threw a block on Janet's leg (perhaps accidentally).

Janet frowned, then cried.

Heidi laughed.

Lucinda frowned.

Janet said, "Heidi, you hurt me."

Heidi continued to laugh.

Janet said, "How would you like it if I threw that block on your knee, huh, huh?"

Heidi thought Janet was fooling and continued to laugh.

Janet threw Heidi onto the blocks.

Heidi said, "Stop it," and cried.

Janet laughed.

Patrick said, "What's the matter?"

Lucinda looked anxiously in Heidi's face.

Heidi and Janet cried (Janet, sympathetic crying).

Janet tickled Heidi and waved her hands in her face, trying to divert Heidi's attention.

Heidi said, "Stop that."

Lucinda said, "Let's go down the slide."

Janet walked away reluctantly with Lucinda.

Patrick said, "What's the matter, Heidi?"

Heidi said, "Janet pushed me down."

Julius watched, worried.

Seth said, "Teacher, Heidi got hurt."

Patrick patted Heidi's head and followed her.

Joyce approached and stared.

Patrick said, "Janet, did you push Heidi down, did you, Janet?"

Lucinda said, "Yes, she did."

Janet said, "Well, she hurt me first. She hurt my knee."

Joyce said, "Why you crying, Heidi; why you crying?"

Patrick said, "Get away, Joyce." Then, "Let her alone," and patted Heidi's face and head.

Joyce said, "Why is Heidi crying?"

Lucinda and Joyce watched from far off.

Joyce's nurse wiped Heidi's face.

Julius approached and watched while the nurse wiped her face.

Reinhardt approached with a ball (no attention to crying).

Julius pulled the ball from Reinhardt (Julius wanted it for Heidi?).

Reinhardt pulled.

Heidi said, "It was Reinhardt's, Julius."

Julius released the ball and said, "Why did you throw the blocks at Janet?"

Heidi said, "'Cause I wanted to."

Julius said, "You mustn't."

Heidi said, "Janet knocked me down."

Julius said, "Well, you mustn't."

Heidi ran to Janet and Lucinda, and they continued playing with blocks.

Janet was a child with a very high score on observation and on teachers' ratings for sympathetic behavior. Her aggression scores were low. Heidi was a friend, a gentle and younger child whom she had often protected and helped. Yet in this situation, Heidi's persistent misunderstanding of Janet's physical injury and Janet's resulting hurt feelings were followed by retaliation on Janet's part and laughter at the injury she had done to Heidi.

In the instance just cited, sympathetic responses, which ordinarily appear in certain situations, are inhibited when the ego of the potentially responsive child is threatened. Variation in the security of the child is, in fact, one of the most important sources of fluctuation in sympathetic response and results in different shifts from one child to another.*

Variations in Sympathetic Behavior in Relation to Motivation in Framed Situations

The play-pen experiment was planned to present a situation sufficiently like playground situations so that some degree of coincidence in the children's behavior might be expected. The child who participated as "stimulus" was twenty-four months old, the age of the younger children to whom older ones in Group *H* had been responding. The arrangement included a one-way screen approximately 4 ft.

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* Margaret Mead comments that among the cultures she has studied, the Mndugomor are never sympathetic except when they are miserable (2). This would be true of most personalities organized around ego values instead of positive social feeling.

from the play pen, behind which the recorders sat, out of sight of both participants in the experimental drama. The strange room, with its screen and dark curtains on one side, was a new experience to the children and undoubtedly contributed to the lack of spontaneity of certain children, who, although active on the playground, were inhibited to the point of inactivity in this situation. The directions outlined for the experiment were as follows:

Physical Setup (see Fig. 3).—A twenty-four months' child in large white play pen; four toys placed outside of the pen, within 2 ft. of it. Play pen is placed 4 ft. from one-way screen.

Procedure.—Before the assistant brings in the subject, the experimenter places child in rear corner of the pen, standing up, with arms over the edge of the pen. The toys are outside the pen. The experimenter then brings in the subject, saying, "You may stay here for a few minutes, I'll be back pretty soon. You may do anything you want to."

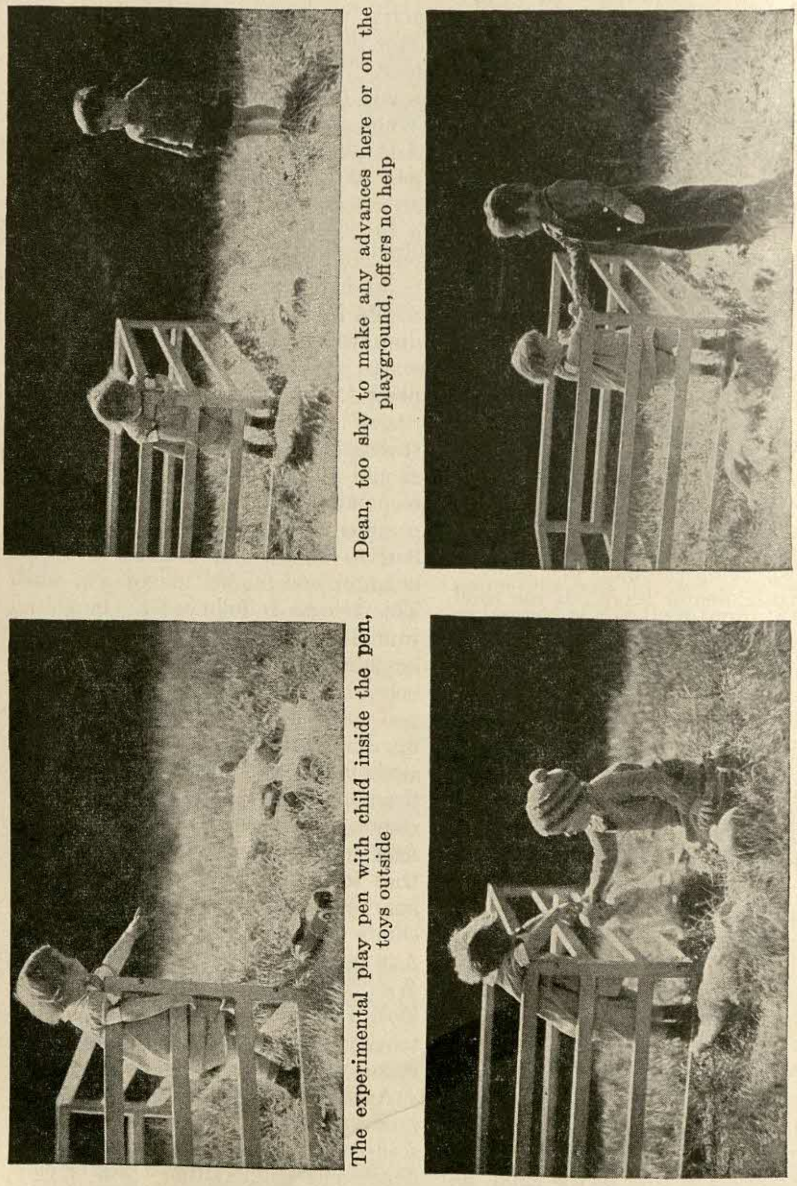
The experimenter leaves. If the child is immediately active, he is not interrupted for 3 min. If he is inactive, the experimenter returns after 30 sec., saying, "She hasn't got any of her things, has she?" Then experimenter repeats the first remarks. After 3 min., experimenter returns and asks, "What do you think she wants?" This question is repeated in different forms. If the subject makes no response, experimenter asks, "Does she want to get out or stay in?" Experimenter then starts to pull out the child, finds difficulty in doing so, waits 10 sec. for help, then asks for help.

Different children's reponses to this situation varied from complete inhibition to immediate and wholehearted response to the child in the play pen.

Gregory's overt behavior gives little clue to his feelings or his perception. In response to both the stimulus of the experimenter and that of the child, he stares or looks around the room. He says almost nothing until the end, when the experimenter asks him a direct question, and then he does not assist the experimenter in lifting Ann out of the pen, after he says that he "could."

Winifred, on the other hand, is actively responsive. First she reassures Ann that her mother is coming back, then, after asking her whether she wants to get out, tries to lift her out. When she does not succeed in this and Ann puts her foot on the bar of the pen, Winifred interprets her action as an attempt to "see," and promises her a toy, again asks if she wants to get out, and gives her the toy. At this point her interest shifts to other elements in the situation, a ball, and a door which reminds her of the toilet where she had just been. She interprets Ann's unintelligible vocalizing as "toys" and attempts to get a clearer statement, looks at her, asks if she should come in, looks at her when Ann responds unintelligibly, pulls the pen, commenting to Ann, pulls it again, and laughs. Her laugh stimulates Ann's laughter and further laughter in both. This release is followed by laughing, tumbling on Ann's part, and more laughter on Winifred's part. Ann has been the stimulus during much of this and now asks if it is time for her to get up. Winifred echoes, "Get up," but is again distracted by her own interest in the auto. Ann laughs more; Winifred responds with more laughter, and asks Ann whether she should get in; she tries to do so, and Ann now watches her. Winifred loses interest again, climbs out, and walks around the room; Ann uses her old stimulus of laughing; Winifred laughs and comes to the pen, looks at Ann, says she wants to tell the teacher, goes out of the experimental room, and does so.

Anthony was a child who was much more responsive in the experimental setup than on the playground, while Janet and Wallis afford cases of children who were unusually responsive on the playground but were inhibited at first in the experimental situation. When we take two children with similar scores on the playground and find radical differences in their scores in a framed situation like that of the play pen, we must conclude that in spite of "controlled" technique, the play-pen situation had different values for different children.



The experimental play pen with child inside the pen, toys outside

Dean, too shy to make any advances here or on the playground, offers no help

Davis offers the child a doll and guards the auto he wants for himself

Heidi quickly gives "the baby" all the toys

Fig. 3.—Sympathy experiments. (*From Murphy, Social behavior and child personality. New York: Columbia University Press, 1937.*)

In other words, this situation was not a simple one, offering few alternatives of response, but a very complex one, affording a variety of possibilities of interpretation and therefore of response, granting the child was emotionally free to respond. All these factors of thresholds for inhibition, selectivity of response to materials as compared with the child, thresholds for egocentric play as contrasted with socially directed cooperation or assistance, and the child's interpretation of the situation, underlay the "sympathetic behavior scores," which are a total of specific behavior items.

Variations in responses of different children were pursued further in observing the children's responses to a series of pictures. These included two pictures of children crying, eight pictures which might be interpreted as representing children in an uncomfortable, dangerous, or painful situation, and three pictures which could not possibly be interpreted in such terms. The pictures were all large glossy prints, mounted uniformly and presented in the same order.

The most interesting aspect of the responses to the pictures was the evidence of identification and projection which appeared in different forms and in certain quite unexpected ways. For instance, one picture of a child inside a low wire garden fence, holding a rabbit, was chosen as a fairly neutral picture but with the expectation that some children might think the rabbit was being injured or was in danger of injury. Actually the pattern apprehended by many children was quite different from that caught by most adults. The dark background recognized by adults as a photographic device was seen by some of the children as evidence that the child was *in* the dark. The fence had dire meaning for a little boy (Reinhardt), who was later discovered to have been left for hours at a time in a play pen.

The range of responses to this picture may be seen from the following protocols:

Saul: "I don't know the picture. It's a little boy. That's a little boy all by himself. Having a bad time because its dark. Look how dark; night time so he don't like it."

Reinhardt: "There's a picture of a boy crying. There's a fence. He can't get out of the garden. There's no door there. He had to stay all day long. Every day, Thursday, Friday, Saturday, Sunday. He didn't like it."

Sturgis: "Where's her house? What's she out there for? Out in the dark for? Out in the dark for?"

Julius: "He's carrying a bunny."

Albert: "The mouse is having a nice time and the girl's having a nice time playing in the grass."

Patrick: "The rabbit's trying to jump down and the girl's trying to ride on the rabbit."

The frequency with which the children responded to the pictures in terms of very individual experiences which dominated their interpretation, and probably their perception, suggested the desirability of further exploration of the child's consciousness of a few common stimuli for sympathy. Two methods were used for doing this. The first was to ask simple, direct questions of an objective and realistic sort, such as "Why do children cry?" The second was to tell a short story about a child in difficulty, and afterward ask for the completion of the unfinished story or questions about the behavior of the distressed child or other children in the situation.

Only three children insisted that they did not know why children cried. Others gave a wide variety of reasons that reflect both individual experience and three-year-old stereotypes:

Jan: " 'Cause they do. Hurt their legs."

Heidi: "Judy cried yesterday because her hand was a little bit cold." (Verified by teacher. Heidi was very much concerned about Judy at the time.)

Saul: "Some children be bad and their mummy spanks them."

Reinhardt: "No children cry."

Alfred: "I don't know much about crying. Big boys don't cry."

Patrick: " 'Cause they fell down a tree."

Janet: " 'Cause they just didn't call for things and things didn't come. Sometimes they get a spanking."

Seth: "Because they want to cry when it hurts them."

Beulah: " 'Cause sometimes the children want to take home a toy and they don't want them to so they cry."

Lila: " 'Cause they hurt their finger."

Kirk: "I do sometimes. Sometimes I get a spanking."

Nancy: "Because no children cry."

Winifred: " 'Cause they're little babies."

Philomena: "Because some children always bump themselves."

Mary: "Because they want to go to bed."

Wallis: "Some children cry. Some don't cry. Some don't cry 'cause they're big boys."

Daniel: " 'Cause automobiles come bump at them and knock them off their tricycles."

June: "Because their mother's not there."

Douglas: "Joan cries."

Peter: "Because they don't. Big children don't cry. Only babies cry."

The tremendous drive among three-year-olds to identify themselves with self-respecting people who do not cry thus seems to block their understanding of the causes for crying. This is not unlike the mechanism which appears among adults who, wishing to identify themselves with the economically self-respecting, blind themselves to the reality and the causes of unemployment.

Out of the four stories which were told, the one about a little boy who lost his mother received the most vivid emotional reactions. Nearly all the children took it quite seriously. The story was as follows:

1. Once there was a little boy named Jackie.
2. He went out to the country with his mother.
3. One day they went for a walk in the woods.
4. The little boy and his mother tried to find some flowers.
5. Pretty soon the little boy called, "Mother, mother!"
6. But he couldn't find his mother.
7. His mother was lost.
8. What did the little boy do?

The following are the answers of boys in group H:

Patrick: "So he cried because his mother was in the woods." (Looked sober at the word "lost.")

Holden: "He cried."

Wallis: "He didn't have any mother, he came back to his mother."

Saul: "He looked and looked and the Big Bad Wolf came."

Reinhardt: "Why didn't he walk as fast as his mother? Did he walk that fast? Where was his mother when he lost her?"

Sturgis: "Where was his mother? What did he do to his mother? Did he call his mother? Why was his mother lost?"

Julius: "Where was his mother? He looked."

Alfred: "He cried . . . (violently). He ran home and told his daddy." (What did he do?) "Went to the woods to find her. Can't find her, because she was eaten up. He played with his father, and not with his mother."

Seth: "Go tell another mother."

While the variations in behavior on the playground appeared to be most significantly related to shifts in security or ego status of the child in the group, the variations in these experimental situations reflect the specific awareness, anxieties, and phantasies that have grown out of home and school experiences. Even at three the conflict between the child's need and the adult pressure introduces distortions into his interpretations of general experiences of distress. And at three, as later, his objectivity is most quickly disturbed by fear.

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CHAPTER XXI

PLAY AND SUBSTITUTE SATISFACTION*

SYBILLE ESCALONA

Introduction

The studies which are reported in this chapter were conducted at the University of Berlin. They are part of a series of investigations that were directed by Prof. Kurt Lewin. The contributions to the series were related so that the results of one led to the basic assumptions of those to follow. In the following we are reporting three experimental investigations of the problem of substitute action and substitute satisfaction. The important procedures and concepts were first developed in the work with adults, and then put to use in a study of children.

Common observation shows that when a person is prevented from completing a task he may turn to another, which is then described somewhat vaguely as a "substitute." It was the purpose of Mahler's and Lissner's studies to determine the conditions under which an activity functions as a substitute in the specific sense that it satisfies the need to carry out another activity. The experiments by Lissner deal with substitute satisfactions of needs on the level of reality, while Mahler's work is concerned with substitute satisfactions on different levels of irreality.†

General Method

Previous investigators had developed a technique for eliciting needs experimentally and for demonstrating both the existence and the effects of unsatisfied needs. The method as it was employed by Ovsiankina (15) may be described as follows: The subject is presented with a series of tasks. Some of them he is allowed to complete; others are interrupted. Following each task, there is interpolated an interval in which the subject is free to do as he pleases. Ovsiankina found that in most instances the interrupted tasks were resumed, whereas in nearly every case the completed tasks were ignored. Why? It was postulated that the intention to carry out a task is equivalent dynamically to a need or a state of tension in a system of the person. So long as the tension exists, the individual is "motivated" to work on the task. Until the task is completed or until a certain amount of time has elapsed the tension is sustained. This means that immediately after a task is interrupted the system corresponding to it is in tension. Therefore, the individual will tend to work on, or resume, the task. If a task is completed the tension corresponding to it is released, with the result that the individual will not tend to resume it. Using the same technique, Zeigarnik (17) proved the existence of residual tensions underlying unfinished tasks by showing that at various lengths of time after her experimental sessions the interrupted tasks were recalled better than completed ones.

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* The satisfaction of needs by substitute actions. This chapter is a summary of investigations by K. Lissner (13), W. Mahler (14), and S. Sliosberg (16).

† See discussion on p. 367 of the levels of reality and irreality. See also Lewin (9, 11, 12) and Brown (2).

Criterion for Substitute Value

Both Lissner and Mahler employed the spontaneous resumption of interrupted activities as a criterion for the presence of unsatisfied needs or tensions. Each subject was required to undertake a series of tasks, and all of them were interrupted. One control and several experimental groups were used. For the control group, the procedure was exactly the same as that employed by Ovsiankina with interrupted tasks; *i.e.*, the subject was left to his own devices after the interruption of every activity, and the percentage of spontaneous resumptions was determined. For the experimental group, another more or less similar activity (substitute) was introduced after the interruption of the original task. The subject was allowed to complete the substitute activity. The idea was to determine whether or not the second task had functioned as a substitute by satisfying the need to complete the interrupted activity. This was accomplished by means of the following comparison. The percentage of times the interrupted task was resumed when, in the control procedure, it had *not* been followed by a second task was compared with the percentage of times the same task was resumed when, in the experimental procedure, it *had* been followed by a second task. The substitute value of each task (or action) that was undertaken after another had been interrupted was expressed by the following ratio.

$$\frac{\text{Percentage of resumptions when a second task had not been given } (R \text{ without substitute})}{\text{Percentage of resumptions when a second task had been given } (R \text{ with substitute})}$$

When this ratio was more than 1.0, it was concluded that the substitute action in question had a positive substitute value. It was assumed that if a subject did not return to the original task and complete it after the completing the second task, the latter had "used up" or released the tension corresponding to the former, *i.e.*, satisfied the need.

The Substitute Value of Substitute Activities

Subjects and Tasks.—Lissner's investigations were carried on during the year 1930–1931. Her subjects were normal adults, most of them students of psychology, who volunteered their services.

Several series of tasks were used. Some of the tasks—modeling with clay, *e.g.*—were manipulative in character, while others, such as the translation of a passage from the French, were of a more intellectual type. For each *original task* one which might be expected to serve as a *substitute task* was provided. The originals and substitutes were paired on the basis of a greater or lesser similarity in goal and pattern of action. Six such pairs of tasks were employed in the beginning stage of the investigation. They are listed below.

Originals	Substitutes
I. Mosaic. To put together the figure of a man from mosaic stones.	I. The same task, but a model is provided.
II. Folding. To fold a square piece of paper into the shape of a boat.	II. The same task, but the necessary creases are indicated on the paper.
III. Modeling. To model a "living thing" from clay.	III. To cover with clay a wire frame in the shape of an animal.
IV. Jigsaw puzzle. To solve a jigsaw puzzle.	IV. To solve an easier jigsaw puzzle.
V. Jumbled syllables. To construct a meaningful sentence from a series of nonsense syllables.	V. The same task, but with an easier set of nonsense syllables.
VI. Translation. To translate a text from the French.	VI. To translate an easier text from the French.

Results. *Resumption in Absence of Substitute.*—It was necessary to determine at the outset the frequency with which the original tasks would be resumed when they were interrupted and no substitute was given. Following Ovsiankina (15), Lissner distinguished between actual spontaneous resumption (R) of the unfinished task and actions which clearly expressed a tendency toward resumption (ΣR). Among the latter were included reaching for the materials required by the task, working on it playfully, talking about ways to finish it, etc. Under the conditions of the first procedure (PI) of the study, the percentage of spontaneous actual resumptions was in no case less than 60 (Table 1:PI).* When tendencies toward resumption were included, the percentage was in no case less than 70.

Resumption after Similar Substitute. The next step (PII) was to determine what the percentage of resumptions would be when the original, interrupted task (O.T.) was followed by a substitute task (S.T.). Under this condition, the percentage of resumptions was reduced significantly in only two instances; *i.e.*, only two of the six substitute tasks exhibited an appreciable substitute value (Table 1:PII). They were substitutes for the translation and the jigsaw puzzle (Tasks IV and VI).

It was concluded that the tension corresponding to an interrupted task may be discharged through the completion of a similar task, but that this does not always occur. An analysis of the different tasks revealed that in the two instances in which the S.T. had shown a substitute value, the O.T. and the S.T. required the same type of action: in one case both tasks were translations; in the other both were jigsaw puzzles. In the remaining four tasks, the end results of the O.T. and S.T. were similar, but the *manner of achieving* the end was different for the substitute than it had been for the

TABLE 1.—THE SUBSTITUTE VALUE OF SUBSTITUTE ACTIONS ON THE LEVEL OF REALITY*

P	T	N	R, per cent	ΣR, per cent	S.V.
I	I	10	60	90	
	II	10	60	80	
	III	10	80	80	
	IV	10	100	100	
	V	10	90	90	
	VI	10	60	70	
II	I	10	70	100	0.9
	II	10	60	80	1.3
	III	13	85	85	0.9
	IV	10	40	55	1.8
	V	10	30	65	1.4
	VI	10	10	30	2.4
III	I	12	25	42	2.1
	II	25	12	24	2.3
	III	20	15	30	2.7
	IV	10	40	45	2.2
	V	10	50	30	3.0
	VI	10	10	25	2.8
III *a*	I†	18	11	72	1.2
	II†	11	73	91	0.9
	III†	22	36	68	1.2
	I‡	10	10	40	2.3
	II‡	8	13	13	6.2
	III‡	10	40	60	1.3
IV	IV§	10	80	80	1.3
	V§	10	90	100	0.9
	VI§	10	30	60	1.2
	IV¶	10	50	65	1.5
	V¶	10	50	70	1.3
	VI¶	10	20	50	1.4
V	I	20	45	70	1.3
	II	20	65	70	1.1
	III	20	30	70	1.1

* This table is a summary of Tables 1 to 8 in Lissner's publication. For this reason it is impossible to indicate totals and averages. These are given in the original report.

† Easy substitute task.

‡ Difficult substitute task.

§ Dissimilar easy substitute task.

¶ Dissimilar difficult substitute task.

P = procedure.
N = number of cases.
T = task number.
R = percentages of actual spontaneous resumptions.
ΣR = percentage of actual resumptions plus actions expressing a tendency toward resumption.

$$\text{S.V.} = \text{substitute value} = \frac{\text{R without substitute}}{\text{R with substitute}}$$

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*PI refers to the data of Table 1 in column P and row I.

original. The findings also suggested that a second factor of importance was the difficulty of the S.T. as compared with the O.T. Where the S.T. was much easier it gave no evidence of substitute value.*

Resumption after Difficult Substitutes. A third procedure (PIII) was carried out to test the significance of the level of difficulty of the S.T. as compared with that of the O.T. Retaining the same original tasks, Lissner designed new and more difficult substitutes. Again, the O.T.'s and S.T.'s were similar, but only in type of action, not in their end results. For instance, the S.T. for Task II (folding) was changed from folding a boat when the necessary creases were already indicated on the paper to folding a suit. The substitute value of these more difficult tasks proved to be almost double that of the easier tasks that had been used in Procedure II (Table 1:PIII).

In order to check on the possibility that this result was traceable to characteristics other than difficulty which differentiated the tasks of Procedures II and III, Lissner carried out a control procedure (PIII*a*) in which she used a new series of original tasks. Each was followed by an easy S.T. and a difficult S.T.† The findings were consistent with the conclusion indicated by Procedure III (see Table 1:PIII*a*).

Comparison of Similarity and Difficulty.—In a fourth procedure an attempt was made to isolate similarity between the original task and the substitute task. An easy and a difficult S.T. were paired with each of three original tasks (IV, V, and VI). The paired tasks were dissimilar. The results were compared with those of Procedure II, in which the corresponding pairs of original tasks and substitute tasks were similar. The comparison indicated that similarity is of greater importance in determining substitute value than degree of difficulty (Table I:PIV).

Comparison of Generalized and Specific Goals.—From statements made during the experiments it became clear that the same instructions meant different things to different subjects. Thus, the instruction to "make a living thing" prompted some to decide immediately upon a specific goal object—*e.g.*, a cat or a dog. Others did not go beyond the vague idea of just any animate object. The data of Procedure III were retabulated on the basis of this classification: subjects who had set themselves a specific goal and those who had not. It was found that for the subjects with a *generalized goal* the average substitute value of the S.T.'s was 6.2, whereas for subjects with a *specific goal* it was only 1.0. Lissner concluded that a need to reach a narrowly defined end is less likely to be satisfied by a substitute action than a need to reach a broadly defined end. This procedure led her to stress the point that in judging the degree to which actions are similar one must consider not only their outwardly manifest "content," but also what they mean to the individual.

The significance of a similarity in goal object, as between the O.T. and S.T., was tested in a fifth procedure. Tasks I, II, and III were used, but in conjunction with new substitutes. The latter differed from the corresponding original tasks in type of activity, but the ends to be achieved were similar. The S.T. for Task III (modeling with plasticine), for instance, was changed from covering a wire frame in the shape of an animal with plasticine to cutting from colored paper an outline of the animate object the modeling of which had been interrupted. Under this condition the substitute value dropped markedly (Table 1:PV). Whereas it had been 2.6 on the average for Procedure III, in which the originals and substitutes were similar in type of action, it averaged but 1.2 for this procedure, in which the O.T. and S.T. were similar only in respect to the goal of action.

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* This points to the relationship between the level of aspiration and substitute value, which would seem to be of great importance. Lissner discusses at some length the connection between these two variables; but space does not permit a restatement of her analysis here. For level of aspiration theory and experimental work, see Frank (4), Hoppe (5), and Jucknat (6).

† The easy S.T.'s were given to subjects of one group and the difficult S.T.'s to subjects of another group.

Interpretation.—The research included also a theoretical analysis of the dynamics of substitute satisfactions. Some essentials of the analysis: If the release of tension in one system is to discharge the tension in another, the two must be in dynamic communication. In other words, they must both be parts of a larger dynamic whole. Similarity in the type of activity and the meaning of the task to the subject may well establish such a connection between the systems corresponding to an original and a substitute task.

Substitute Value and Degree of Reality

The Problem.—The study by Mahler of substitute action on levels of irreality was occasioned in part by the emphasis upon the concept of unrealistic substitute satisfactions which was prevalent in the field of abnormal psychology. Freud especially maintained that dream experiences may yield satisfactions that are denied to the person in reality and that symbolic actions in neurotic patients may release tensions due to frustration.

In her research on anger, Dembo (3) had distinguished *reality-irreality* as a dimension of the life space.* (Life space means the totality of facts that make a difference to behavior. These facts are contained within the limits defined by the-person-interacting-with-the-environment.) One might identify the level of reality by saying that it is the stratum of "things as they really are." It could then be said of any irreality level that it is the stratum of "things as one would like them to be." The irreality levels are those of dreams, hopes, and the like. They may be characterized dynamically in terms of a relatively fluid medium. This is to say that the conditions on the levels of irreality are changed more readily by the forces which act in the life space as a whole. Lissner's experiments had proven that under certain conditions a substitute action on the level of reality leads to a release of tension in the system corresponding to an unsatisfied need. Mahler's problem was to ascertain whether or not this is true of substitute actions on levels of irreality.

Subjects and General Method.—Mahler's experiments were conducted with 155 adults and 35 children. The children ranged in age from six to ten years. Her technique was similar to that used by Lissner. There was, however, one crucial difference. The substitute action which followed the original task consisted in working not on an entirely new task, but only on a *substitute completion* (S.C.) of the original task (O.T.). The subject was asked to finish the interrupted activity in a different way than that which it would ordinarily require. Following Lissner, Mahler calculated both spontaneous resumptions (R) and actions expressing a tendency toward resumption (ΣR). The substitute value of each substitute completion was determined by the formula:

$$\text{S.V.} = \frac{\Sigma\text{R without S.C.}}{\Sigma\text{R with S.C.}}$$

Types of Substitutes.—Four different types of substitute completion were used, each designed to fall at a different point on the scale of reality-irreality. Listed in the order of increasing degree of irreality, the different types of completions were: (*a*) by action, (*b*) by speech, (*c*) by thought, and (*d*) by "magical thinking." Examples of the first three types of completion follow. (The fourth will be characterized later.)

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* *Cf.* pp. 394—395, Chap. XXII of this volume.

a. O.T.: to puncture the outline of a word on paper with a needle; S.C.: to finish the outline of the word with pencil.

b. O.T.: to number a batch of blank sheets of paper with a pencil; S.C.: to count the remaining sheets of paper orally, without marking the numbers on the pages.

c. O.T.: to work out an arithmetical problem on paper; S.C.: to finish it "in the mind."

TABLE 2.—FREQUENCY OF RESUMPTION AND SUBSTITUTE VALUE OF INTERRUPTED TASKS WITH S.C.'S BY ACTION AND BY SPEECH FOR CHILDREN AND ADULTS

Subjects	S.C. by action					S.C. by speech				
	Without S.C.		With S.C.			Without S.C.		With S.C.		
	N	ΣR, per cent	N	ΣR, per cent	S.V.	N	ΣR, per cent	N	ΣR, per cent	S.V.
Children (PI*a*)	28	77	26	33	2.3	14	79	14	64	1.2
Adults (PI*b*)	24	65	24	29	2.2	12	67	12	42	1.6

Results. *Comparison of Action and Speech.*—The first procedure (PI) was designed to establish the percentage of resumption for each of the tasks when no substitute completion was given and to determine whether or not substitute completions by action and by speech would affect the percentage of resumptions. There were two phases of the procedure, one in which children were used as subjects (PI*a*) and the other in which the subjects were adults (PI*b*). The results (Table 2) of both showed that the substitute completions effected a considerable reduction in the frequency of resumptions and that the substitute value of completions on a level of reality (action) was higher than that of completions on a level of irreality (speech).

Comparison of "Internal" and "External" Goals.—Mahler recognized that the designation of all substitute completions by action as more real than those by speech was somewhat arbitrary. A study of the data indicated that the degree of irreality of a substitute completion varies significantly according to the meaning of the original task to the subject. For each task, Mahler distinguished an "*external goal*" and an "*internal goal*." An external goal she defined as the specific objective that was prescribed by the experimenter. She characterized as an internal goal the objective which the subject set for himself.

An example of this distinction may be cited by referring to the two original tasks: to number with a pencil a series of crosses on a sheet of paper, and to number with a pencil a batch of blank sheets. The external goal of these two tasks was similar; in both, objects were numbered in writing. However, remarks by the subjects showed that the internal goal of the tasks was quite different. In the former case, it consisted in ascertaining the number of crosses, while, in the latter, it was to label each page and so differentiate it from the others. After counting crosses orally as a substitute for numbering them with a pencil, the percentage of resumptions was but 17.0 per cent. After counting the blank pages orally as a substitute for numbering them with a pencil, it was 73 per cent. In the first case the substitute completion had been a means of reaching the internal goal of the original task, while in the second instance it had not.

Table 3.—Frequency of Resumption and Substitute Value When the Internal Goal of the Original Task Is and Is Not Reached by Means of the Substitute Completion

The data for substitute completions by action and by speech are combined in this table

Without S.C.			With S.C.		
P	N	R, per cent	N	R, per cent	S.V.
I*a*+	28	71	26	29	2.5
I*a*−	14	89	14	71	1.3
I*b*+	24	60	24	13	4.6
I*b*−	12	75	12	75	1.0

+ = cases in which internal goal is reached.
− = cases in which internal goal is not reached.

In order to determine whether the substitute value of a task depends upon whether it enables the subject to realize *his* objective in undertaking the original task, Mahler reanalyzed the data yielded by Procedures I*a* and I*b*. She calculated separately (*a*) the substitute value of all substitutes with goals that were similar to the internal goal of the original tasks; and (*b*) the substitute value of all substitutes for which this did not hold. The classification was based upon the subjects' comments during the experiments and upon their introspections, which were obtained after each experimental session. She found that, for both the child and the adult subjects, the S.V. was higher under the first of these conditions (Table 3).

This finding was tested further by a second experimental procedure using two new tasks. One was solving an arithmetical problem on paper, and the other was constructing a box out of paste and cardboard. For both, the substitute completion was telling the experimenter how this task might be finished. Mahler assumed that expressing verbally a solution to the problem would enable the subject to reach the internal goal of this task, but that talking about a completion of the box would not bring the subject to the goal set in undertaking the *real* thing. She reasoned that, if the substitute value of a substitute completion depends upon the degree to which the S.C. subserves the internal goal of the original task, the substitute value of the S.C. for solving the problem should be higher than that of the S.C. for making the box. The results confirmed this expectation. In the one case the substitute value was 8.5, whereas in the other it was only 0.9.

Substitute Value of "Magical Thinking."—In the procedures reported thus far, the substitute completions were not far removed from the level of reality. Dembo (3) had reported that when her subjects were unable to reach a goal in reality, they tended to "escape" into "the realm of fancy." They contrived fanciful solutions disregarding the real requirements of the task at hand. Mahler undertook to determine whether substitutions of this order have substitute value.

She set out by devising a procedure utilizing two difficult tasks of the problem type. One was to solve a Chinese mechanical puzzle and the other was to solve a problem in abstract thinking. After the interruption the experimenter said: "Imagine you had magical powers and could do anything you wanted to do. How would you complete this task?" Table 4 shows that "magical thinking," as Mahler called this variety of completion, did not prevent the subjects from resuming the interrupted work on the puzzle, but that it did appear to have substitute value for the "thought problem." However, the behavior of the subjects made it seem unlikely that their failure to resume the latter task was due to a release of tension. The experimenter thought it more likely that the subjects had lost interest in consequence of the belief that they had been "taken in."

TABLE 4.—FREQUENCY OF RESUMPTION AND SUBSTITUTE VALUE OF SUBSTITUTE COMPLETIONS BY MAGICAL THINKING IN REALITY AND IRREALITY SETTINGS

Task	Without S.C.		With S.C.		
	N	R, per cent	N	R, per cent	S.V.
Chinese puzzle...	5	80	6	67	0.8
Thought problem	6	33	6	83	2.5
Balloon (A)......	3	67	6	92	1.4
Balloon (B)......	7	57	6	92	1.6

A further approach to the same problem was made in a slightly different manner. This time a problem which in an experiment by Dembo (3) had elicited conspicuously irreal substitute solutions was employed. A balloon was placed in a corner of the experimental room at a considerable distance from the subject, who was seated at a table. The subject was asked to get the balloon without leaving his chair, and he was persuaded that the problem was solvable. Actually, it was not. A long stick, an adequate tool, was in sight but out of reach. Approximately 35 per cent of the subjects produced irreal solutions spontaneously. One proposed to inhale vigorously and so carry the balloon on a current of air. Another contrived an accommodating, imaginary earthquake. Almost all the subjects showed some annoyance when the interruption occurred and magical thinking was suggested. Apparently all were eager to "really solve" the problem, and so it was not surprising to find that the substitute value of the fanciful solutions was not high (Table 4).

These results indicated that highly irreal substitutes would not satisfy a need to reach a goal which had been set on the level of reality.

Substitute Satisfactions for Irreal Needs.—If the goal of the original task were set on an irreal level, would an irreal completion have substitute value? With this possibility in view, a procedure was devised in the form of a game. Each subject was given several sheets of paper on each of which a direction to perform a simple "stunt" was written. The balloon task was presented as before, with the exception that, after the interruption, the subjects were handed a "magic wand" with which they were to induce the requisite change in the position of the balloon. Table 4 shows that in this case the S.C. did effect some release of tension. However, the substitute value was relatively low. This was explained on the grounds that several of the subjects did not enter into the phantasy spirit of the situation, because of embarrassment or a general disinclination to be playful. For them, the magical solution did not function as a substitute.

In a variation of this procedure, the subject was interrupted with a request that he make up a fairy tale. The point was to determine whether the subjects (15 adults) would use the tale as a medium for substitute completions by incorporating references to the interrupted task in their productions. Only 6 of the 15 failed to mention the balloon. Two referred to it but did not use the story to modify the reality situation: a character in the story also failed to obtain the balloon. The remaining seven did weave into their tales an incident in which somebody got a balloon or an object which Mahler interpreted as a symbol for a balloon. Here, it would seem that an unsatisfied need was *expressed* in a "substitute" action. But was the need *satisfied* by the action? Nearly all the subjects resumed the task after the story had been told. One might represent the conclusion from this experiment by saying that substitute *expression* does not necessarily have substitute value.

Comparison of Children and Adults.—The incidence of irreal substitute actions in children presents a number of interesting problems. In general, shifts from the level of reality to levels of irreality occur with greater ease and frequency in children than in adults (13). With this in view, Mahler carried out a modification of the procedure mentioned last with 13 children. The original task consisted in searching for a piece of chocolate which was hidden in the experimental room, and the substitute completion was to bring it from hiding by the use of a "magic wand." Three different conditions were provided after the interruption of this task: (*a*) a free period; (*b*) a substitute completion was required and another piece of chocolate was given to the child; (*c*) the substitute completion was required. Under the first of these conditions, the task was resumed in 100 per cent of the cases. Under the second and third, it was resumed in only 17 and 29 per cent of the cases, respectively, and the resumptions occurred only in the form of questioning the experimenter as to the hiding place of the chocolate.

Substitution in Serious and Play Situations

General Problem.—Sliosberg (16) was interested in the study of substitute behavior in children as a means of getting a clearer understanding of the child's conception of the world in general. Since the concepts of substitute and symbol have been so closely linked in psychological theory, she thought it of special interest to ascertain under what circumstances children achieve the satisfaction of needs by means of substitute activities. To her thinking, the psychological interpretation of the child's conception of the world, notably the theories of Piaget, Stern, Koffka, and Karl and Charlotte Bühler, permit inferences regarding the ease with which children will accept substitutes for specific objects. If the child up to seven or eight years of age does not distinguish between thought and object, between thing and thing symbolized, he should readily accept substitutes as equivalent to the original object. If, on the other hand, there exists for the child a clear differentiation between the "world of adults" and the "world of play," and if the same object has an entirely different significance depending upon whether the child views it as a real object or as a play object, there is no reason to suppose that children will accept substitutes, at least in reality situations, more readily than do adults. The experiments to be reported here were designed to substantiate one or the other of the above hypotheses and to throw some light on the relationship between reality and phantasy or play in the young child.

Subjects and General Method.—Sliosberg's subjects were 123 children ranging from 3.0 to 6.8 years in age. All of them were familiar with the experimenter and had established a friendly nonauthoritarian relationship with her before the series of experiments was begun.

Results in Serious Situation. *Substitutes for Somatic Needs in Developed Situation.*—In the first part of her experiments (I*a*), Sliosberg chose to work with an easily aroused somatic need, the appetite for candy. The experimental procedure was as follows:

The child entered the room and began to play or converse informally with the experimenter. After a few minutes the experimenter asked the child whether he would like to have some candy, and, if the answer was in the affirmative, produced several pieces from a bag, and put them into the child's hand. As the child put the candy into his mouth, the experimenter said: "Please put down your candy. I'll give you some other ones." He then offered the child a few pieces of cardboard similar to the candy in size but not in shape.

The original object (O.O.) was real candy and the substitute object (S.O.) was cardboard. The resulting behavior on the part of the children was classified into three categories: (*a*) the S.O. was completely refused; (*b*) the S.O. was accepted not as a substitute for the O.O., but was used *according to its own nature* (*e.g.*, instead of trying to eat the cardboard, the child used the pieces to lay patterns on the table); (*c*) the S.O. was accepted temporarily; it was tried out as a substitute for the O.O. and refused when found unsuitable for this purpose (*e.g.*, the child put the cardboard into his mouth and rejected it upon finding it unsatisfying).

TABLE 5.—RESPONSE TO SUBSTITUTE OBJECTS IN PROCEDURES I*a* THROUGH IV*b* IN PERCENTAGES

Procedure	*N*	Age range in years	The substitute object is:						
			Completely refused	Treated according to own nature	Accepted on trial basis	Called by name of O.O.	Child refuses but hopes to receive O.O. again	Treated like O.O. in "gesturelike" manner	Completely accepted
I*a*	10	3.0–4.10	50	10	40	0	0	0	0
	10	5.0–6.8	70	30	0	0	0	0	0
I*b*	12	3.0–4.11	17	32	17	17	0	17	0
	10	5.1–6.5	40	40	0	0	20	0	0
II*a*	10	3.1–4.10	20	20	40	20	0	0	0
	11	5.0–6.5	55	29	9	7	0	0	0
II*b*	10	3.1–4.11	0	20	60	10	0	10	0
	10	5.1–6.4	40	30	0	10	0	20	0
III*a*	11	3.0–4.11	9	9	36	9	0	9	28
	9	5.2–6.5	55	22	11	0	0	12	0
III*b*	10	3.0–4.9	10	20	10	10	0	10	40
	10	5.0–6.5	30	50	0	10	0	10	0
IV*a*	10	3.0–4.11	0	40	0	0	0	0	60
	10	5.0–6.9	0	10	0	0	0	0	90
IV*b*	11	3.0–4.8	37	27	0	9	0	0	27
	10	5.0–6.2	20	50	0	0	0	0	30

Table 5 shows that the majority of the children (50 and 70 per cent, respectively, for the younger and older group) rejected the S.O. altogether. A few accepted it but treated it according to its own nature (10 and 30 per cent, respectively), and 40 per cent of the younger children accepted it on a trial basis, while none of the older ones made this attempt. The results show that children of this age level were well able to differentiate between reality and irreality in this situation.

Substitute for Somatic Need in Undeveloped Situation.—It was thought possible that the refusal of the S.O. in Procedure I*a* was influenced by the fact that the child had already possessed the O.O. and that the difference between the O.O. and the S.O. was thereby experienced very sharply. In Procedure I*b*, when the child had accepted the experimenter's suggestion to have some candy, he was given some cardboard pieces from a bag that looked like a real candy bag. Table 5 shows that here too the S.O. was treated unlike the O.O. by all but two children. However, it is to be noted that complete refusal did not occur so frequently and that the S.O. was treated in more different ways by a comparable group of subjects. The more important behaviors observed in this last undeveloped situation (I*b*) and not in the developed situation (I*a*) were: treating the S.O. according to its own nature but referring to it by the name of the O.O. (*e.g.*, a child would call the cardboard pieces "candy" but refuse them as a substitute for the real candy); treating the S.O. as though it were the O.O. but in a "gesturelike" manner.*

An analysis of the differences in the situations created in Procedures I*a* and I*b* brought out the fact that I*b* was less defined than I*a* and therefore permitted a greater variety of behavior. The partial acceptance of the S.O. is viewed as a shift away from the level of reality toward levels of a greater degree of irreality. This behavior was much more common in Procedure I*b*. Sliosberg concluded that the rejection of a S.O. for an edible O.O. depends largely upon: (*a*) the momentary degree of differentiation of the life space in regard to the levels of reality and irreality, and (*b*) the extent to which the child is bound to the eating situation. These two factors are, of course, not independent of each other.

Substitution for Nonedible Objects.—The following six experimental procedures (II*a* through IV*b*) employ three different nonedible objects (scissors, pencil, and ball) that were used as O.O.'s and replaced by cardboard pieces resembling the O.O. in size. For example, real scissors (O.O.) were replaced by cardboard scissors (S.O.). Developed and undeveloped situations were compared for each of the three objects. Table 15 shows that the results of Procedures II*a* and II*b*, as well as III*a* and III*b*, were parallel in all essentials to those of I*a* and I*b*. In none of the experiments, 123 cases in all, was the S.O. ever treated like the O.O. for more than a few seconds.†

Substitution and Flexibility of Situation.—In the serious situation, then, the need for the original object is not satisfied by the substitute object. The differences between the developed and the undeveloped situations were most pronounced in the eating situation (Procedure I) and least in the drawing situation (Procedure III); and the behavior of the children in the developed situations where nonedible objects were substituted (II*a*, III*a*) was more varied than it was when edible objects were substituted (I*a*). This means that the developed situation with nonedible objects somewhat resembles the undeveloped situation with an edible object. From Sliosberg's analysis of the situations in question it is apparent that this greater variety of behavior is coincident with a freer situation, in which the function of the object to be substituted (O.O.) is less narrowly defined. (The function of candy is more definitely defined than that of scissors; the use of scissors is more limited, however, than that of a pencil.)

This hypothesis was tested in the next experimental procedure (IV) where the original object, a rubber ball, was one that permitted many different uses. If the activity with a ball tends to change the degree of reality of the situation, the subject should accept the S.O. much more readily than under any of the previously mentioned conditions. This expectation was fulfilled. In Procedure IV*a* 75 per cent of the children accepted the S.O. as such (as compared to 5 per cent in the previous procedures), and complete refusal of the S.O. did not occur at all (as compared to 42 per cent in previous procedures).*

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* For further variations, see Table 5.

† The behavior of some of the younger children (28 and 40 per cent, respectively) in Procedures III*a* and III*b* who accepted the S.O. as a substitute would seem to contradict this. Sliosberg explains this deviation in terms of the independent pleasure which young children commonly experience in scribbling (found when pencil was used), where the resulting marks on the paper seem the least important part of the process.

Summary and Interpretation.—The results of the above sections of the experiments indicated that in a serious situation children accept substitutes for objects, at least to some degree, if they enter levels of some degree of irreality; and, furthermore, that the substitute objects are acceptable to them only in the light of what they mean within the irreality situation. Such a differentiation of the life space into levels of varying degrees of reality occurred more readily the freer and more playlike the situation was (difference between somatic and nonsomatic need; difference between developed and undeveloped situation). At no time did a confusion between reality and irreality occur. These results led Sliosberg to predict that the increased flexibility and other dynamic characteristics of the play situation would increase the tendency to develop irreality levels and would therefore favor the acceptance of S.O.'s.

Results in Play Situations.—In order to test this prediction, Sliosberg carried out a series of experiments parallel to those already reported, except that in every instance the whole experiment was embedded in a situation of playing with a doll.† The procedures were conducted as follows:

> As the child entered the experimental room he saw a corner arranged for doll play, complete with doll's carriage, clothes, dishes, and similar articles. Most children began to use this material spontaneously and the others did so upon invitation. When the child became engrossed in the play he was asked: "Shall we give the doll some chocolate?" (or scissors, whatever the S.O. in question was). Otherwise the procedure varied in no way from that in the serious situations.

Substitution for Edible Objects.—Table 6 shows that under these circumstances (V*a* and V*b*) the behavior of the children was totally different from that in Procedures I*a* and I*b*. More than half of the subjects (60 and 100 per cent, respectively) now accepted the S.O. as a substitute for the O.O., and no complete refusal occurred. The older children tended to accept the S.O. more readily than did the younger ones. Thus, immediate complete acceptance for the younger children was 30 per cent, for the older children 80 per cent. It was thus shown that, though the children played with great intensity, the character of the play situation was for them altogether different from that of the serious situation.

Substitution for Nonedible Objects.—Still greater substitute value was shown by a substitute for a nonedible toy, scissors (Procedure VI). The objection might be raised that the scissors were more easily substituted in the play situation because they played a less important part in the total situation than was the case in Procedure II. In order to check on this possibility the experiment was repeated with an O.O. of vital importance to the play situation (doll's dishes, Procedure VII). Small squares of cardboard similar in size to the dishes were offered as substitutes. All children accepted the S.O. without hesitation.

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* Table 5 shows that the difference between the developed and undeveloped situation in Procedure IV is opposite to that found in all previous procedures. This is due to the different effect which actually possessing the O.O. has in this case. The situation of playing with a ball (IV*a*) is actually freer than that of being promised a ball (IV*b*) so that the character of the two situations in regard to the rigidity of the situation is reversed.

† Doll play was chosen because various writers have stressed the great reality which this play has for most children and because it is usually a very intensive type of play.

In order to see how far such an uncritical acceptance of S.O.'s quite dissimilar to the O.O.'s would go, the experiment was repeated (VIII*a*), but this time the doll itself was replaced by an *elongated paper ball*, which, in contrast to the real doll, had neither face nor arms nor legs. Eighty-four per cent of the subjects treated the S.O. just as they had treated the O.O. and 68 per cent accepted it without hesitation.*

TABLE 6.—PLAY SITUATION. THE RESPONSE TO SUBSTITUTE OBJECTS IN PROCEDURES V*a* TO IX*b* IN PERCENTAGES

Procedure	*N*	Age range in years	The substitute object is							
			Completely refused	Treated according to its own nature	Accepted on trial basis	Treated like O.O. in "gesturelike" manner	Half-accepted	Temporarily accepted	Completely accepted	
									Hesitation	
									Some	No
V*a*	10	3.0–4.10	0	0	0	0	20	20	30	30
	5	5.0–6.0	0	0	0	0	0	0	20	80
V*b*	10	3.1–6.0	0	0	0	0	0	0	0	100
VI	12	3.1–6.0	8	0	0	0	0	0	0	92
VII	12	3.0–6.2	0	0	0	0	0	0	0	100
VIII*a*	12	3.0–6.2	16	0	0	0	8	8	0	68
VIII*b*	12	3.0–6.2	0	0	0	0	0	0	8	92
IX	12	3.1–6.2	67	0	0	0	0	25	0	8

Thus the substitution of the doll's dishes proved much easier (100 per cent complete acceptance) than any of the other objects regardless of whether or not they were of central importance to the initial play situation. In order to discover the significance of this difference the experiment was repeated with another variation. In Procedure VIII*b* the S.O. for the doll consisted of an elongated paper ball which had face and arms marked on it with pencil. In this case the S.O. was accepted by all subjects (92 per cent immediate acceptance, 8 per cent acceptance after slight hesitation). Sliosberg concluded that the doll's dishes and the doll (when the S.O. was the paper doll with distinguishable features) were accepted so readily because the S.O. could fulfill the same function which the O.O. had fulfilled (*i.e.*, things could be placed on the cardboard pieces as though they were dishes; the paper doll could be fed by bringing the spoon to the mouth). The acceptance of the S.O. was more difficult in the instances where it differed from the O.O. in such a way that it lacked characteristics which would be of importance in the play with the O.O.†

Relation between Serious and Play Situations.—Sliosberg attempted to discover whether the character of the particular situation in which the child finds himself at any one time tends to alter his conception of his entire environment at the same time, or whether it is possible for regions of different dynamic characteristics to exist side by side; *i.e.*, once the differentiation of the life space into various levels of reality has taken place (play situation), does the child tend to regard his entire environment as partaking of the irreal properties of this immediate situation, or are the serious and play situations maintained quite apart from each other?

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* It is interesting to note that whatever hesitation in the acceptance of the doll was observed occurred only among the younger children, who indicated that they would have preferred the real doll though they took the S.O.

† This conclusion is substantiated in the original report by several excerpts from the experimenter's records exemplifying the children's specific demand for a mouth on the doll, etc.

Procedure IX closely resembled Procedure VII; the initial play situation was used and scissors were the O.O. The difference consisted in the fact that in Procedure VII the scissors were brought into the situation in such a manner as to make them a part of the play in progress ("Shall we give the doll a pair of scissors?"). In Procedure IX the scissors were introduced as something apart from the doll play. While the child was playing, the experimenter asked, "Would you like to have a pair of scissors?" As soon as the subject had grasped the real scissors the experimenter said she had made a mistake, and, taking back the O.O., offered the S.O. instead (paper scissors). This procedure, which differs from VII only in the fact that the experimenter did not verbally connect the scissors with the doll play, brought forth entirely different results. Sixty-seven per cent of the children now refused the S.O., and the subjects behaved very much as they did in the serious situation. It became clear, therefore, that while the child plays, only those objects that are a part of the play are readily accepted as substitutes, while objects that have no relation to the play are treated just as they are in a serious situation.

Substitution and State of Need.—In the preceding procedures, Sliosberg explored the significance of the situation for the treatment of the substitute object. In the following, she turned to the question of whether or not the acceptance or refusal of an S.O. depends also upon the state of the need. In experiments parallel to those already reported she compared the frequency of acceptance of S.O.'s *before* and *after* the satisfaction of the need. This was accomplished by timing the offer of the S.O. differently in the two situations. In Procedures X and XI the children were offered the S.O. while they were still greatly interested in the use of the O.O. In Procedures XII and XIII the S.O. was not offered until the child seemed to have lost most of his interest in the activity with the O.O.

Substitution for Unsatiated Need.—Table 7 shows that in Procedure X (O.O. scissors, S.O. cardboard scissors) the substitute is refused by all children. Sliosberg interpreted this to indicate that where a strong need corresponds to the use of an object in a serious situation the children are bound to the real world to a high degree, *i.e.*, the meaning of the object is univocally determined. The findings in Procedure XI were exactly the same: the children completely refused the S.O. and demanded the real candy.

Substitution for Satiated Need.—Procedures XII and XIII tested the acceptance of the same S.O.'s after a certain satiation* with the object had taken place. Under these circumstances, refusal of the S.O. occurred only in 25 and 40 per cent of the cases, respectively. Where a refusal did occur it was

On the whole there existed a great difference in the treatment of the S.O. in situations before and after the satisfaction of a need.

Substitution and Nature of Object.—Another factor that was thought to influence the acceptance of a substitute object is the nature of the object. In the following series of experiments the character of the situation and the state of the need were kept constant while the objects to be substituted were varied.

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* See Karsten (7) for experimental studies of satiation.

TABLE 7.—THE RESPONSE TO SUBSTITUTE OBJECTS IN PROCEDURES X TO XIV*d* IN PERCENTAGES

			The substitute object is						
Procedure	*N*	Age range in years	Completely refused	Treated according to its own nature	Accepted on trial basis	Called by the name of the O.O.	Child refuses S.O.; hopes to receive O.O. again	Treated like O.O. in "gesturelike" manner	Completely accepted
X	12	3.1–5.8	100	0	0	0	0	0	0
XI	20	3.1–4.8	100	0	0	0	0	0	0
XII	12	3.1–5.6	25	13	0	25	0	37	0
XIII	10	3.1–5.8	40	20	0	10	0	30	0
XIV*a*	6	3.0–4.6	0	0	0	0	0	0	100
	9	5.0–6.6	0	11	0	0	0	0	89
XIV*b*	13	3.0–4.9	28	0	0	0	0	0	72
	10	5.1–6.6	10	0	10	0	0	0	80
XIV*c*	14	3.1–4.8	31	69	0	0	0	0	0
	9	5.0–6.0	22	44	12	0	0	0	22
XIV*d*	7	3.1–4.6	0	0	0	0	0	0	100
	7	5.1–6.7	0	0	0	0	0	0	100

Fixity of Substitute Object.—The initial situation chosen was block building, which allows a great deal of freedom. After the children had begun to build with blocks they were offered substitute building materials which differed from the original objects both functionally and externally (Procedures XIV*a* to XIV*d*). The following objects were used as substitutes: pieces of clay, pebbles, wooden animals, and parts of wooden animals. Ninety-four per cent of the children accepted the clay, 76 per cent accepted the pebbles, approximately 11 per cent accepted the wooden animals, and 100 per cent accepted the parts of wooden animals. Sliosberg interpreted these findings to mean that the S.O. proves the least acceptable to the subjects the higher its degree of fixity.* Clay and pebbles have a relatively low degree of fixity and were therefore accepted quite readily. The children perceived the wooden animals to be something entirely different from blocks or building materials in general and using them as blocks went contrary to their definition of the use of toy animals. The fact that it was not the physical characteristics of the wooden animal which disturbed the children, but their meaning, was tested by sawing the wooden animals into parts, thus depriving them of their "animal character." In this case all children utilized the pieces as blocks.

Fixity of Original Object.—The last four experimental procedures pertained to the influence of the fixity of the O.O. upon substitute value. Wooden animals and small cars were used as S.O. and O.O. respectively ; *i.e.*, both the S.O. and O.O. had a high degree of fixity. In these circumstances none of the children accepted the S.O.

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* By fixity Sliosberg understands the degree to which the function of an object is defined. The more different activities that can be carried on with one and the same object, the less fixity is ascribed to this object.

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CHAPTER XXII

THE EFFECT OF BARRIERS UPON STRENGTH OF MOTIVATION[*]

HERBERT F. WRIGHT

The Problem

Early studies (13) of motivation were concerned largely with constitutional factors, the "mainsprings of action" in the "nature" of the individual. For many recent investigations (12) the area of inquiry is the network of conditions that exist and affect behavior when it occurs. These conditions obtain of the whole formed by the-person-interacting-with-the-environment. The task in attacking problems of motivation is to determine the ways in which the parts of this whole, the *life space*, interact to produce changes in behavior.

At any one time the life space may contain needs, abilities, goals, barriers, tools for doing or getting things, other persons—whatever makes a difference to psychological events. Among these determiners of action, barriers play a decisive role. They function crucially in learning (1). A principal factor in the process of acculturation is getting adjusted to restrictions of one kind or another (5). In experiments with children it has been shown that strong obstacles may effect regression (2).

A barrier is defined here as a part or *region* of the life space that resists locomotion through it in the direction of a goal. According to this definition a barrier and a goal are inseparably related. It follows that an analysis of the way they are related is important for an understanding of behavior in any situation that includes a barrier. Such an analysis was attempted in this research.

The point of departure for the investigation was a notion met frequently in nonscientific literature. A familiar version of it is the proverb: "Grass on the other side of the fence is greener."[†] The following restatement of this proposition is the central hypothesis of the study. *An obstructed goal has a stronger positive valence than an alternative accessible goal.*

In terms of what may be observed directly, a positive valence is a property a region has if an individual goes or in any way tends to go toward it. Everyday words that suggest the meaning of the term are "desirability" and "incentive value." A positively valent region is the same as a goal. The postulating of a positive valence is a short cut to these affirmations: there is a region in the environment with certain discriminable characteristics (like edibility, bigness, littleness, brightness); there is a need or a state of tension in a system of the person; entering the region (*e.g.*, eating) would satisfy the need or release the tension. Further, to say that a region has a positive valence implies that a force is acting on the person in the direction of the region. The relation of tension and forces to valence will be given more consideration later.

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[*] From a monograph by the writer (16). Adapted with permission of Duke University Press.

[†] Other versions: There is nothing so good as forbidden fruit. A fence between makes love more keen. The ass does not know the value of his tail until he has lost it. *Nitimum in vetitum, semper cupimusque negata.*

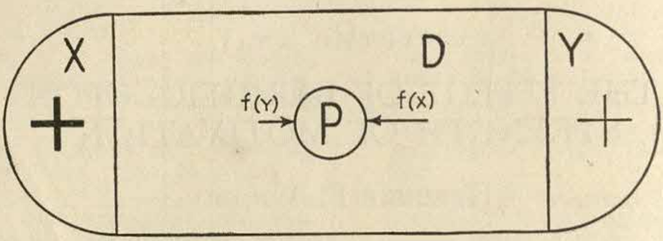

FIG. 1.—A simple choice situation involving two alternatives. The plus signs symbolize valences, and the arrows stand for forces. (The bigger the plus sign the stronger the valence, and the longer the arrow the stronger the force.)

The study is to be classified with investigations of general laws rather than with inquiries about behavior that is peculiar to any developmental level. It is of significance to child psychology in two ways. First, it illustrates the use of children as subjects in research on problems of behavior-in-general. Secondly, it contributes toward an understanding of differences between child and adult behavior.

The main idea in a broad view of the method is that in order to predict behavior one must represent the *structure* and *dynamics* of the life space.

Structure means the interpositional relationships of parts in a whole. Here, then, it means the spatial layout of the person together with all of the things that influence his behavior. By dynamics is meant forces causing change. A structural representation shows what behavior is possible, and a dynamical representation shows what behavior has to occur.

In the diagrams that follow a geometry called *topology* is used to represent facts of structure. The diagrams also represent dynamical facts: valences and forces.

These conceptions are included in *topological* (structure) *and vector* (dynamics) *psychology*. It is important that this "psychology" is a *method* and not a "school" or a set of principles about behavior.

Procedure and Results

The Structure and Dynamics of the Test Situation.—The procedure in testing the hypothesis was as follows: Under various conditions the valence of an accessible object (A) was compared with the valence of an obstructed object (B). Accessible and obstructed objects respectively were things relatively easy and relatively hard to get. Choice between A and B was the criterion used in making the comparison.* The choices were registered in action or verbally; *i.e.*, in some of the procedures the subject was required to get what he chose, while in others he was required only to state a preference. Controls were used to ensure that the valences of A and B would be equal without a barrier between the individual and B.

It will be advantageous to examine certain factors in choice behavior as they relate to the experiments. The analysis presupposes that a choice is determined by a resultant of psychological forces (*Cf.* 11, 4, 6).

Figure 1 represents a case in which a person (P) confronts two alternative regions (X and Y). Both X and Y are positively valent. There is a force [$f(X)$] toward X and a force [$f(Y)$] toward Y.† P is in the region of decision (D). The valence of X is greater than the valence of Y. This means that the force toward X is stronger than the force toward Y

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* Other criteria were employed in experiments for which there is no space here (see 16).

† A simplified way of symbolizing forces is used in this report (see 11).

$[f(X) > f(Y)]$. Therefore, the resultant acting on P is directed toward X, and P will choose—get or say he wants—X.

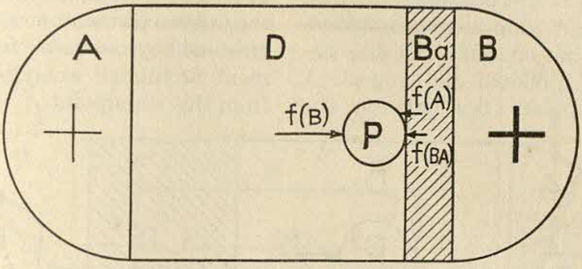

FIG. 2.—A choice situation including a barrier in which the resultant force is directed toward the obstructed region.

A more intricate choice situation is represented in Fig. 2. Assume that if other things were equal the valences in regions A and B would be the same in strength. But other things are not equal. As in the experiments, a barrier (Ba) is interposed between the person and region B. By hypothesis, then, the valence of B exceeds the valence of A. Therefore, the force toward B is greater than the force toward A. However, the resultant is complicated by the *restraining force* $f(Ba)$ corresponding to the barrier. This force and the force toward B are opposed. Thus, in calculating the resultant one must subtract $f(Ba)$ from $f(B)$. The resultant will be directed toward B only when the following holds: $[f(B) - f(Ba)] > f(A)$. If, as shown in the figure, there is this distribution the individual will select B.

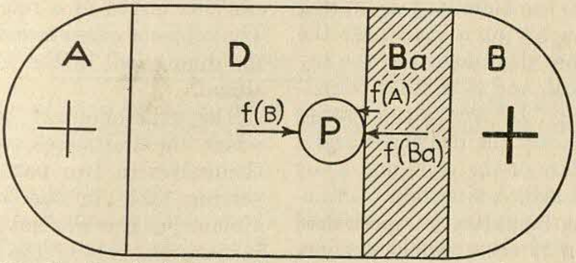

FIG. 3.—A choice situation including a barrier in which the resultant force is directed toward the accessible region.

Another possibility is represented in Fig. 3. The structure is the same as in the second situation. So are the forces, with one exception: The restraining force is stronger. It is enough stronger that: $[f(B) - f(Ba)] < f(A)$. The resultant force is toward A, and, therefore, A is chosen. This is true even though the valence of A is lower than the valence of B. The critical point is that in an actual case of this kind the stronger valence of B would not show in behavior. If the dynamics were to be mirrored consciously the individual might say: "I *choose* A, but I *prefer* B." One could venture to put it more fully: "You prefer B because B is hard to get, but you choose A because B is *too* hard to get."

One must consider the possibility that the degree in which the valence of B exceeds the valence of A might increase according to the strength of the barrier. In this case, the greater restraining force of the stronger barrier would be offset more or less by the stronger force toward B; and within limits, at least, this increase in the force toward B might be greater than the gain in the restraining force. It is possible, then, that a tendency to choose B

would rise with an increase in the strength of the barrier.

Further, relating to restraining forces, there is the possibility that an obstacle might form a *limiting boundary*. By definition, a barrier lies between the individual *and* a goal. A limiting boundary lies between the individual and what might otherwise be a goal. An example is the boundary on either side of which there is a college instructor and a million dollars. Another example, from a preliminary experiment, is the boundary separating a child and a toy on a shelf near the ceiling. Neither the money nor the toy becomes a goal, and so neither boundary is a barrier. By contrast, a barrier might lie between the instructor and a hundred dollars or the child and a toy just out of reach. A situation containing a limiting boundary is represented in Fig. 4. In it there would occur a choice of *A*.

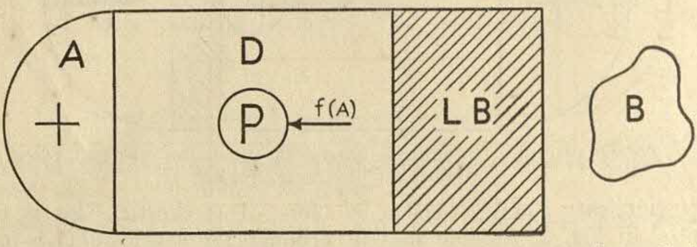

FIG. 4.—A limiting-boundary situation. Region *B* is represented as *foreign* to the life space.

Time, Place, Subjects.—The experiments were carried out in Durham, N. C., under the auspices of the Department of Psychology of Duke University, during a period of approximately 19 months beginning in July, 1932. Children and adults were used as subjects.

The child subjects ranged in age from four through eleven years. All of them were pupils of schools in Durham, and the experiments in which they participated were conducted in rooms of the different school buildings. No consideration will be given to age and sex differences among the child subjects. The inconsiderable age range and the uneven distribution as to sex of the girls and boys available for each experiment prohibited analysis of the data from this standpoint.

The adult subjects were students at Duke. The locale of the procedures in which they took part is specified below.

A Choice-in-action Experiment with Adults.—In this experiment the hypothesis was tested in a real-life situation. The subjects were student waitresses of the dining hall in the Duke Women's Union.

The experimenter* placed desserts which the waitresses were to get for themselves in two parallel rows on a serving table in the kitchen of the Union. One row was not more than 2 in. in from the side of the table near the subject when she came to get a dessert, and the two rows were approximately 12 in. apart. The more and less remote desserts respectively comprised the *B* and *A* objects of the experiment. The desserts were set down as they were prepared for serving, and the number in the two rows was kept equal. The task of reaching for the *B* desserts was complicated by the fact that there was a shelf 18 in. above the table. The main features of the physical situation are represented in Fig. 5.

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* A young woman recommended by the management of the Union. She was a helper in the kitchen, and it was her job to dish the desserts and put them on the table.

Upon each occasion when observations were made only one kind of dessert (*e.g.*, cherry pie) was served. But always all the desserts did differ from one another, however slightly, in size and shape.[*] May it not have been, then, that they differed in valence apart from the influence of the barrier? This is a possibility; but it was assumed that a chance distribution over a large number of cases would provide for the requisite equality.

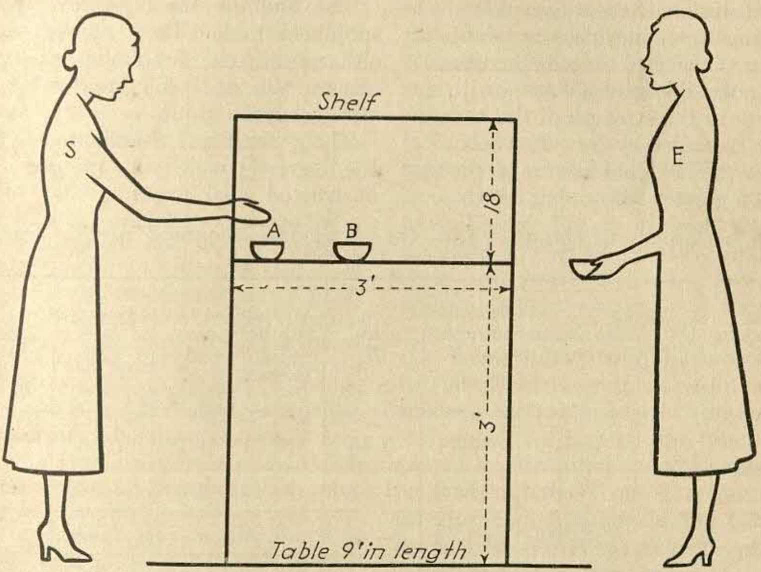

FIG. 5.—The physical situation (cross section) in the Union experiment. (*From Contributions to Psychological Theory*, 1937, 1, *No.* 1, p. 40, *reproduced with permission of Duke University Press.*)

The choices of B and A desserts were recorded on 14 different occasions. (An occasion is treated in the statistics as the equivalent of a case.) The number of subjects averaged 26.42, and varied from 12 to 31.

The results were as follows: The average number of B choices for each occasion was 15.86 ($\sigma \pm .84$), while the average number of A choices was 10.57 ($\sigma \pm .64$). The difference between the two averages is 5.29, and the critical ratio of the difference 5.08.[†] These data are consistent with the hypothesis.

The distance between the B and A desserts was varied in two series of seven occasions each. In a *near-B series* it was decreased to approximately 2 in.[‡] In a *far-B series* it was increased until the B desserts were barely within reach of the subjects.

There was a lesser preponderance of B choices in the near-B than in the original tests. The B choices averaged 14.89, and the A choices 11.31, the difference being 2.58 with a critical ratio of 2.97.

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[*] The possibility that this fact of nonidentity as between the A and B objects was significant is considered in connection with other experiments. See pp. 386 and 393.

[†] The sigmas and critical ratios are mentioned only because they indicate low variability in the data. The number of cases is too small to warrant their being taken very seriously.

[‡] It is apropos that all the waitresses were required to wear sleeveless dresses.

In the far-*B* procedure the choices favored decisively the *A* desserts. The average number of *A* and *B* choices respectively was 26.00 and 1.57.

A comparison of the results for the near-*B* and the original series points to the conclusion that, within limits, at least, the degree in which the valence of an obstructed goal exceeds the valence of an accessible goal increases with an increase in the strength of the barrier. This is indicated by the choice behavior despite the fact that a stronger barrier exerts a greater restraining force.

The outcome of the far-*B* series suggests that the hypothesis is not demonstrable when the strength of the barrier is increased beyond a certain point. But it may be that in this situation the distance to the far desserts was a limiting boundary rather than a barrier. It was observed that most of the girls "paid little or no attention to them." One could not be sure that the far desserts figured in the choices.

Each dessert was ranked by the experimenter as to desirability, *i.e.*, strength of valence, on a scale of one to five, and after the period of the experiment every dessert that had been served on a test occasion was so ranked by ten of the subjects. On the basis of the data secured by this means, the test occasions of the original series and the near-*B* series were divided into weak-valence and strong-valence groups. An occasion was included in the strong-valence group when the dessert used in it had been ranked above 3. An occasion in which a dessert had been ranked below 2 was placed in the weak-valence group.

The findings are presented in the subjoined table. They show that in either series the preponderance of *B* choices was markedly greater for the strong-valence group.

The generalization indicated is that the degree in which the valence of an obstructed goal exceeds that of an alternative accessible goal increases when the valences are increased in strength.

B and *A* Choices in Original and Near-*B* Series according to the Valence Rank of Desserts

Test series	Number of occasions	Valence group	Average number of *B* choices	σ av. *B*	Average number of *A* choices	σ av. *A*	Difference *B*-*A*	Critical ratio
Original	7	Strong	17.71	0.36	10.71	0.45	7.00	12.50
	7	Weak	14.00	1.32	10.43	1.20	3.19	2.72
Near-*B*	3	Strong	16.33	....	12.00	....	4.33	
	4	Weak	13.75	....	12.50	....	1.25	

It has been mentioned that the observations were made when the girls came before the serving table to select desserts for themselves. Previous to this each girl had completed her work as a waitress. A part of the work consisted in carrying desserts from the serving table, on which they had been arranged in several rows by the experimenter, into the dining hall of the Union. Over a period of 1 week it was observed that while the girls were performing this duty nearly all (approximately 97 per cent) of about 1,700 desserts were taken from the nearest row.

The following distinction would seem to represent the main difference between the *work situation* and that in which the girls served themselves. Under the latter condition the *A* and *B* desserts were alternative goal objects: Getting a dessert was an end in itself. But while the girls were on duty the *A* and *B* desserts were alternative means objects: Getting a dessert was only a means to the end of doing a job acceptably. If this distinction is correct, the negligible number of *B* choices in the work situation implies that the hypothesis may not hold for means objects.

There is the argument that the difference between an end and a means is relative. One form of it states that every goal in the environment is only a phase of a sequence that ends in "physiological quiescence" (15). But the task in representing the life space is not to reveal the origin of its parts, to disclose by any kind of analysis what lies "behind." The task is to represent the configuration of conditions as they exist for the individual at the moment. It is urged that: some things do exist for the individual as tools to use or places to get through or beyond; they are seen as lying between the position of the person and another region; in adjusting to them one has the experience of looking forward to and *really* being interested in something else. Other things exist as objects or places or states to get *to* rather than through or beyond; they are seen as lying ahead at what is for the time being a terminal point; in adjusting to them one may not have in the least the experience of looking on to something else. Ordinarily, forks, sidewalks, and tickets fall in the first category; candy, home, and peace, in the second. But a particular thing, *e.g.*, one of the desserts, might be a means at one time and an end at another, depending on the circumstances, *i.e.*, the structure of the whole situation. It would seem that introspectively the difference between a means and an end is sharp. Probably better criteria for it should be contrived. Meanwhile, that the difference is a real difference is indicated by the evidence in the study that it makes a difference.

The problem of means *vs.* goals recurs in connection with procedures that remain to be reported (see pages 386 and 393).

Choice-in-action Experiments with Children. *String-suspension Experiment.*—The essential conditions of this procedure were similar to those of the Union experiment. Pupils of a nursery school and a kindergarten served as subjects.

Two lengths of string were suspended, each 15 in. from the corner formed by two walls of the experimental room. The strings were fixed to the walls so that the distance between their lower ends and the floor was adjustable. At the end of each string, a small piece of stick candy was placed in the curve of a bent hairpin. The two pieces of candy were identical in every respect. One piece (*B*) was made to hang 11 in. beyond and the other (*A*) 11 in. within reach of the child as he stood on the floor. In order that the distance to *B* should not form a limiting boundary a playroom chair was placed directly beneath *B*.

The subject was brought into the room to a point equidistant from *B* and *A*, where attention was called to the two candies. Standing behind the child* so as not to influence his choice by expression or gesture, the experimenter† said: "You may get either one you want."

There were eight tests, and in each the *A* object was chosen.

Observations indicated that a dominant factor in the situation was the restraining force of the barrier, and that the children chose *A* despite a preference for *B* (see page 381); that, in short, the distribution of forces may have been as shown in Fig. 3. For example, Marie (5; 8)‡ went toward *B*, paused, appeared to gauge the distance to the candy, actually reached toward it, placed one foot on the chair,

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* This practice was followed in all the individual experiments with children.

† The writer, as in every case unless otherwise stated.

‡ Five years and eight months.

In the far-*B* procedure the choices favored decisively the *A* desserts. The average number of *A* and *B* choices respectively was 26.00 and 1.57.

A comparison of the results for the near-*B* and the original series points to the conclusion that, within limits, at least, the degree in which the valence of an obstructed goal exceeds the valence of an accessible goal increases with an increase in the strength of the barrier. This is indicated by the choice behavior despite the fact that a stronger barrier exerts a greater restraining force.

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The findings are presented in the subjoined table. They show that in either series the preponderance of *B* choices was markedly greater for the strong-valence group.

The generalization indicated is that the degree in which the valence of an obstructed goal exceeds that of an alternative accessible goal increases when the valences are increased in strength.

B AND *A* CHOICES IN ORIGINAL AND NEAR-*B* SERIES ACCORDING TO THE VALENCE RANK OF DESSERTS

Test series	Number of occasions	Valence group	Average number of *B* choices	σ av. *B*	Average number of *A* choices	σ av. *A*	Difference *B*-*A*	Critical ratio
Original	7	Strong	17.71	0.36	10.71	0.45	7.00	12.50
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The following distinction would seem to represent the main difference between the *work situation* and that in which the girls served themselves. Under the latter condition the *A* and *B* desserts were alternative goal objects: Getting a dessert was an end in itself. But while the girls were on duty the *A* and *B* desserts were alternative means objects: Getting a dessert was only a means to the end of doing a job acceptably. If this distinction is correct, the negligible number of *B* choices in the work situation implies that the hypothesis may not hold for means objects.

There is the argument that the difference between an end and a means is relative. One form of it states that every goal in the environment is only a phase of a sequence that ends in "physiological quiescence" (15). But the task in representing the life space is not to reveal the origin of its parts, to disclose by any kind of analysis what lies "behind." The task is to represent the configuration of conditions as they exist for the individual at the moment. It is urged that: some things do exist for the individual as tools to use or places to get through or beyond; they are seen as lying between the position of the person and another region; in adjusting to them one has the experience of looking forward to and *really* being interested in something else. Other things exist as objects or places or states to get *to* rather than through or beyond; they are seen as lying ahead at what is for the time being a terminal point; in adjusting to them one may not have in the least the experience of looking on to something else. Ordinarily, forks, sidewalks, and tickets fall in the first category; candy, home, and peace, in the second. But a particular thing, *e.g.*, one of the desserts, might be a means at one time and an end at another, depending on the circumstances, *i.e.*, the structure of the whole situation. It would seem that introspectively the difference between a means and an end is sharp. Probably better criteria for it should be contrived. Meanwhile, that the difference is a real difference is indicated by the evidence in the study that it makes a difference.

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There were eight tests, and in each the *A* object was chosen.

Observations indicated that a dominant factor in the situation was the restraining force of the barrier, and that the children chose *A* despite a preference for *B* (see page 381); that, in short, the distribution of forces may have been as shown in Fig. 3. For example, Marie (5; 8)‡ went toward *B*, paused, appeared to gauge the distance to the candy, actually reached toward it, placed one foot on the chair, again hesitated, turned to glance toward *A*, quickly looked a last time at *B*, finally moved with decision to *A*, seized it, and then looked up at the experimenter with an expression on her face which is described in the notes as "sheepish"—as much as to say: "I've done the best I could under the circumstances." The experimenter asked her why she had chosen *A*, and she replied, "The other one is too high." Similar answers were made to the same question in two other cases.

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* This practice was followed in all the individual experiments with children.

† The writer, as in every case unless otherwise stated.

‡ Five years and eight months.

In order to reduce the restraining force of the barrier, a slight variation was introduced in a second stage of the experiment.

A chair like the one used in Stage 1 was placed approximately 3 ft. from the vertex of the angle formed by the walls against which the two pieces of candy were suspended and equidistant from each piece. Having been brought into the room, the child was instructed to stand upon this chair, in order that he might better be able to view and judge between the pieces of candy. Actually, the idea was to make it easier for the child to get *B*.

Ten children, none of whom had participated in the first stage of the experiment, were used. *B* was secured by only two of them.

It occurred to the experimenter that in this experiment the conditions differed from those of the Union setup in that identical *B* and *A* objects were used. Accordingly, the procedure was varied by providing *B* and *A* candies which differed in color. Two color combinations were used—one yellow, green, and white; the other red, green, and white. Each was an *A* object in half of the tests and a *B* object in the other half.

In all of the experiments involving nonidentical *B* and *A* objects, the control specified in the foregoing sentence was applied. Unfortunately, in this one case a record was not kept of the choices as to color. However, in no one of the other procedures did there occur a persistent choice of a particular object regardless of whether it was available or obstructed. Obviously, in all experiments yielding decisive results—a conclusive preponderance of *B* or *A* choices—each of the differing objects had to be chosen an equal or, at least, a not significantly unequal number of times.

The conditions were the same as those in the second stage of the experiment except for the variation in respect to the *A* and *B* objects. There were 19 subjects. Ten of the nineteen chose *B*.

This result, when it is considered with the outcome of the Union procedures and set against the data obtained in the first and second stages of the string-suspension experiment, suggests that: of alternative objects, one accessible and the other obstructed, the latter is more likely to be chosen if the two differ than if they are identical.*

Means-goal Experiment.—The purpose of this procedure was to subject to a special test the finding of the Union experiment which indicated that the hypothesis cannot be shown to hold for means objects.

The experiment was conducted in two stages. In the first, there were presented to each child of one group *B* and *A* alternatives which under the circumstances functioned as goal objects. In the second, there were presented to each child of another group the same *B* and *A* alternatives, but under conditions such that they functioned as means objects. In both, the criterion was choice in action. The subjects of the two groups respectively were pupils, eight to eleven years in age, of two grade schools situated in widely separated parts of Durham.

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* Further consideration will be given to this possibility. See p. 393.

Three other procedures similar to that of the string-suspension experiment were tried. None of them yielded results decisively in line with the hypothesis.

In the goal-object stage two sponge-rubber balls, one blue, the other green, and both 3 in. in diameter,* were placed on a table, one ball 4 in. in from the side near the position of the subject at the moment of choice, and the other the same distance in from the opposite side. The balls were placed so that, with the child on the near side of the table and facing the mid-point of it, one was approximately 10½ in. to his left, and the other equally removed to his right.†

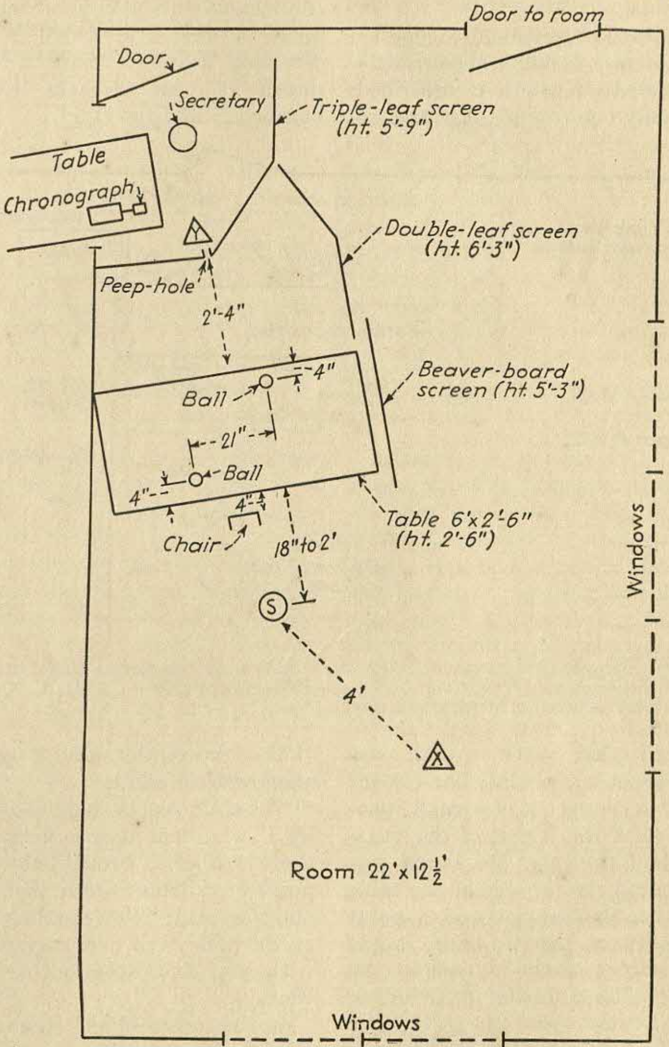
Door to room
Door
Secretary
Triple-leaf screen (ht. 5'-9")
Table
Chronograph
Double-leaf screen (ht. 6'-3")
Peep-hole
2'-4"
4"
Ball
21"
Ball
4"
4"
Beaver-board screen (ht. 5'-3")
Table 6'x2'-6" (ht. 2'-6")
Chair
18" to 2'
S
4'
X
Windows
Room 22'x12½'
Windows

FIG. 6.—The physical situation (view from above) in the goal-object stage of the means-goal experiment. (*From Contributions to Psychological Theory*, 1937, **1**, *No.* 1, *p.* 71, *reproduced with permission of Duke University Press.*)

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* A reminder: The differing *B* and *A* balls were changed after every test so that a ball of each color was used an equal number of times as a *B* and an *A* object.

† In order to guard against fixations determined by handedness, the right-left position of the balls was changed after every even-numbered test.

A corner of the room was screened off to form an observation chamber. The physical situation is represented in Fig. 6.

In the means-object stage, except for minor differences in detail, the arrangement differed from that described above in only one respect: A barrel, so constructed that when a ball was thrown into it a chocolate bar (5-cent Hershey bar) came out of a small opening in its side, was a part of the situation. In half the cases the barrel was placed behind the far side of the table in line with the subject and a point midway between the two balls. It was 2½ ft. in front of the subject at the moment of choice. In the other half of the cases it was placed 2½ ft. directly behind the subject. The purpose in varying the location of the barrel in this way was to guard against the possibility that it (or the candy within it) might effect a "field distortion" favoring locomotion toward the ball nearer to it. The physical situation in the means-object stage of the experiment is shown in Fig. 7.

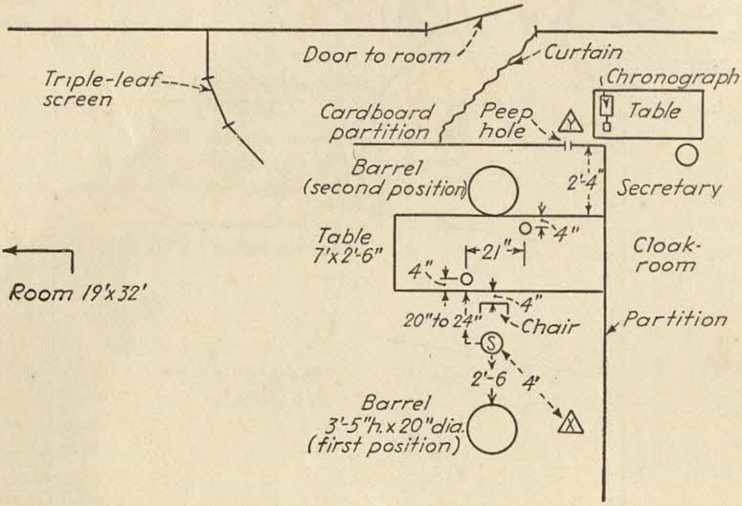

FIG. 7.—The physical situation (view from above) in the means-object stage of the means-goal experiment. (*From Contributions to Psychological Theory*, 1937, **1**, *No.* 1, *p.* 72, *reproduced with permission of Duke University Press.*)

Two experimenters (X* and Y†) conducted both stages of the experiment. A secretary, seated in the observation chamber, made a verbatim record of the remarks exchanged between X and the child.

The procedure in the goal-object stage was as follows:

The child was brought into the room by Y, who went at once to the observation chamber. X brought the child to a point equidistant from the two balls and then said: "You see these two balls on the table; well, you may get, to take with you and keep, either one you want."

In the means-object stage, after the child had been shown to the room, X took a ball from his pocket and at the same time asked: "How would you like to have a bar of candy?" Receiving an affirmative answer in every case, X demonstrated how one could be secured by throwing the ball into the barrel.

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* The writer.

† A fellow graduate student.

Then he said to the child: "You see those two balls on the table. Well, you can get a bar of candy if you take one of the balls and throw it into the barrel."

In the goal-object and means-object stages, respectively, there were 52 and 53 subjects.*

The results: In the goal-object stage *B* was chosen in 21, or 41 per cent, of the cases. This percentage agrees closely with the data for the stage of the string-suspension experiment in which the *B* and *A* objects differed, and with findings of similar child experiments of the study that are not reported here. In the means-object stage, *B* was chosen in only 4, or 8 per cent, of the 51 cases. (Eleven of the 21*B* balls chosen in the goal-object stage were green, 10 blue. In the means-object stage, the choices of the four balls were divided evenly as to color.)

The following interpretation is made of these data: The proposition that the valence of an obstructed goal is stronger than that of an accessible goal does not apply to means objects.

An attempt is made in Fig. 8 to represent the situation of the child (*P*) at the moment of selecting a ball for the purpose of throwing it into the barrel. The goal (*G*) is getting the chocolate bar. Picking up a *B* or an *A* ball is a region between the individual and this goal.† Some resistance has to be overcome in entering either region, but region *B* offers the greater resistance: As a means, it is the more difficult. Now, experiments with animals have shown that, when an organism is confronted with a goal, it tends to adopt the "readiest means" (3) to it. The findings have been formulated in the "principle of parsimony" (1). One might use this principle in explaining the selection of the *A* ball. In terms of forces, the following analysis may be made. Region *B* (getting the far ball) and region *A* (getting the near ball) each exert a restraining force. The restraining force *f*(*B*) corresponding to *B* is the stronger. Therefore, the resultant force toward *G* on the path from *D* through *B* is weaker than the resultant force toward *G* on the path from *D* through *A*. Therefore, *P* selects *A*.

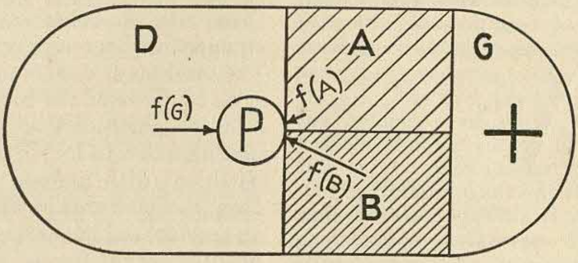

FIG. 8.—A choice situation in which the alternatives are means to a goal and the resultant force is toward the easier means.

According to Fig. 8 neither region *A* nor region *B* has a valence. This representation is intended. It is proposed, moreover, that, in general, a positive valence cannot properly be ascribed to a means object. Often, and especially in some theories of learning, the contrary is assumed (15). Thus, a means is identified frequently as a subgoal. In short, means are assimilated to the category of goal objects (*i.e.*, positively valent regions). Quite a different possibility is that they should be grouped with barriers. On the side of structure (interpositional relationships in the life space) there is the fact that a means, like a barrier, is interposed between the person and a goal; it is a region to get through or beyond and not, like a goal, a region to get to or stay in. On the side of dynamics (forces) there is the fact that a means, like a barrier, offers some resistance. A means, *e.g.*, a mule, can be very refractory, or, of course, like a good car, only a little refractory. These characterizations imply that the difference between a means and a barrier is only a difference in degree. This idea is contained in the suggestion by Adams (1) that the runway of a maze should be treated as a barrier.

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* One means-object case and two goal-object cases were excluded. See 16, p. 74.

† Activities, no less than objects, may be represented by regions in the life space (10).

James and others have pointed out that means—like paths in the woods on a fine day—may become goals (*cf.* 11). But one infers from this the presumption that, *as means*, they do not have goal character. An untenable consequence of assuming that a means has a positive valence is considered by Lewin (11, p. 96): With an increase in the number of means regions ahead on a path there would be an increase in the resultant force toward the goal.

It is ventured that a means is more like a weak barrier than a subordinate goal. If a barrier does not have a valence, and this is assumed, neither has a means. One might say then of the conclusion stated above: The proposition that an obstructed goal has a stronger valence than an alternative accessible goal does not apply to means objects because a means object does not have a valence.

Bar-enclosure Experiment.—In all the experimental situations considered thus far the test of the hypothesis was made in advance of overt locomotion toward the obstructed object. By definition, again, a barrier exists only in relation to a goal. One can be sure that this relation obtained only when *B* was chosen. It is possible that when *A* was chosen *B* had not even been a part of the field.

In order to provide a situation including a barrier the reality of which would be assured by locomotion toward a goal, a procedure was carried out in which the choice test occurred in the course of overt approach toward *B*. The subjects were preschool and kindergarten children.

An enclosure 6 ft. square and 4½ ft. high was set up in a corner of the experimental room, adjoining which there was an observation chamber equipped with a one-way vision screen. The enclosure was bounded on two sides by walls of the room, on a third side by a partition made of heavy wire netting, and on a fourth by a cardboard partition (with a wood frame) 18 in. deep, in the center of which there was an aperture as high as the enclosure and broad enough for a child to pass through it. Ingress through the aperture was obstructed by three successive columns of wooden bars. In each column there were 15 bars projecting through holes in the frame on one side of the aperture. The contrivance was such that the bars could be shifted—as one would throw the bolt on a door—to allow entrance into the enclosure. Two toys (the *B* objects) were placed in the enclosure on a table.

There were two experimenters (*X** and *Y*†). *X* showed the child how he might get into the enclosure to procure the toys by shifting the bars. After the child had made a good start on the task, *Y* came into the room from the observation chamber with a second pair of toys‡ (the *A* objects), put them on a table outside the enclosure, and returned at once to the observation chamber. *X* then called the attention of the subject to the *A* toys, making sure that he turned to look at them, and said: "Do you want to go ahead and get the toys in there, or would you like to play with these?"

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* The wife of a faculty member in the psychology department at Duke.

† The writer.

‡ Different combinations of toys were used interchangeably as *B* and *A* objects for the boy and girl subjects. For the boys: tin auto racer and cardboard fort; wooden wagon and tin roadster. For the girls: box of wooden beads and wooden telephone; metal stove and small set of dishes. It was explained to the children that they were to play with the toys only during their visit to the experimental room.

Twenty-one children were used in the experiment. Eighteen procured the *B* toys. Two of the remaining three *said* they would rather have the toys in the enclosure before they took the others.

A possibility which had to be considered was that shifting the bars or getting into the enclosure or both had a valence in addition to that of the *B* objects. One subject said that she wanted to get in the "little house." Another manipulated the bars after she had entered the enclosure and before getting the *B* toys.

Several observations stand against this possibility: Eight of the subjects were given a little practice on the task of getting into the enclosure via the bars before participating in the procedure as described above. They went about the assignment apathetically and had to be persuaded to stay by it, whereas in the experiment proper they did the job with speed and vigor. Thirteen of the subjects who got the *B* toys shifted just enough bars for the purpose. One, after shifting several, climbed into the enclosure and seized the toys at once. Nine of the children were observed to fixate the *B* toys visually while shifting the bars. In only two cases did the subjects show any interest in exploring the enclosure after entering it. In four cases the children quickly removed the *B* toys from the enclosure and played with them in the larger space outside.

A consideration overlooked in planning this experiment is that the test involved the interruption of a task—moving the bars to get the toys. Now, Ovsiankina (14) has demonstrated that, when a task is undertaken, there is set up a state of tension which disposes the person to complete the task or, following an interruption, to resume it. It may be that the outcome of the experiment should be admitted only as evidence in support of this demonstration. It would seem that, as the procedure had been designed to guarantee, the *B* toys were obstructed, and it may be that the *B* valences were the stronger. But the data are open to this other interpretation. It is an interesting possibility that proverbial statements of the hypothesis are based in part upon cases in which operation of the "interrupted-task principle" is a factor.

Comparison of the Child and the Adult Choice-in-action Experiments.—It is clear that the one experiment with adults yielded a better case for the hypothesis than the comparable experiments* with children. Why?

A technical point is that probably for the child subjects the situations were more artificial. The children were available only during the experimental periods. For this reason each of them saw the experimental room as a novel place, and the brief excursion to it as something of an adventure, one offering, perhaps, a welcome reprieve from school doings. Occasionally—not often—a child would behave as if getting what he wanted were less important than acquitting himself well in an odd sort of game. The waitresses by contrast were observed as they went about an everyday affair.

A second factor which may have contributed to the difference is *generalized-goal tension.* In the Union situation getting a dessert was only a minor incident of a three-times-in-a-day routine. But in the child experiments getting a piece of candy or a ball was a big thing. Nearly every child had learned from the subjects who preceded him what the "prize" was to be, with the result that many arrived on the scene in an anxiety of anticipation. And the main idea was to get a thing *of the sort* which the others had displayed. Often it looked as if out of interest in the generalized goal the child could not be bothered with choosing between particulars, least of all with choosing the thing that was hard to get.

The following might be correct in some cases. Take the experiment in which the alternatives were candies. There was in a system (*C*) of the child a state of strong tension corresponding to the generalized goal (*G*), *a* piece of candy. Spreading, this tension effected a dedifferentiation of the subordinate systems.* The systems corresponding to *A* (one-piece of candy—accessible) and *B* (another piece of candy—obstructed) were included in *C*. Therefore, separate states of tension could not be set up in these systems. Therefore, *A* and *B* were not alternative *goals*. There was only one goal, *G*. In relation to it *A* and *B* were *means*. In line with the distribution of forces shown in Fig. 8 the child chose the easier means, *A*.

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* String-suspension experiment and means-goal experiment, goal-object stage.

One consideration bearing on this matter stands out above others. It is that probably for the children the restraining force of the barrier before the *B* objects was greater than for the adults. Common observation leads one to judge that, while it was inconvenient for the waitress to get the far dessert, it was a much harder and a *bigger* thing for the child to get the far ball or piece of candy. The experimental observations, such as the one of Marie, bear out this judgment. It is not improbable, then, that for many children in the choice-in-action experiments the distribution of forces was like that of Fig. 3. In other words, it may be that the force *f*(*A*) toward *A* was weaker than the force *f*(*B*) toward *B*, but that the strength of the restraining force *f*(*Ba*) was such as to produce a resultant in the direction of *A*.

Verbal-choice Experiment with Children.—Assume that in the choice-in-action experiments with children the force toward *B was* greater than the force toward *A*, and that the component in the resultant which determined choice of *A was* the restraining force of the barrier. In this case one would expect that changing the situation in such a way as to effect a sufficient decrease in the strength of the restraining force would yield a resultant determining a selection of *B*. The verbal-choice experiments may be viewed as providing such a change on the following grounds: It is easier for a child to say he wants or likes a thing than it is for him to get it. Otherwise stated, the restraining force of the barrier between the child and *B* should be weaker when he is asked only to say whether he prefers *B* or *A* than when he is required to get *B* or *A*.

Cage Experiment (I).—Two toys (the *B* objects) were put in a cage (25 by 19 by 16 in.) made of wire netting. The cage was situated on a table. Two other toys (the *A* objects) were placed on the surface of the table near the cage and in line with the *B* toys.†

The subjects were 18 preschool and kindergarten children. Each child was brought into the room and asked to rank the toys by stating which he thought the "nicest," "next to nicest," and so through all four.

The results: The *B* toys were ranked above the *A* toys in 61 per cent of the tests, and the reverse was true in only 11 per cent of the tests. A *B* toy was ranked first in 66 and second in 88 per cent of the tests. In 55 per cent of the tests the *B* toys were ranked first and second. In no case were the *A* toys ranked first and second.

Similar results accrued from an experiment which differed from this one only in the respect that the *B* and *A* objects were candies. The subjects were 19 kindergarten children. There was a lesser preponderance of *B* choices. This, however, was predicted on the basis of the consideration that the generalized-goal tension engendered by the candies would be greater than that set up by the toys (see 16, pp. 80–83).

String-suspension Experiment.—A possibility which it was necessary to examine in evaluating the data of the cage experiment was that the thing-in-the-way itself, while it functioned as a barrier, might have had a positive valence. As a matter of fact, only 1 of the 18 subjects showed any interest in the cage, and he merely asked what it was for—after ranking the toys. However, in order to check on this possibility, a procedure was carried out in which there was nothing interposed between the child and the *B* objects.

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* Lewin (9) and others (8) have shown that the person of the child is a relatively fluid medium. In this connection, see Chap. XI.

† The combinations of toys used interchangeably as *B* and *A* objects were: red felt dog on all fours and yellow plane; black felt dog on his haunches and red plane differing in design from the yellow plane.

The string-suspension technique was used, and two small lollipops were the *B* and *A* objects. One of the lollipops hung 11 in. within and the other 11 in. beyond the reach limit of the child. After bringing the subject to a point equidistant from the two candies, the experimenter said: "Tell me which one you like better, and I'll get it for you."

The subjects were 19 kindergarten children. Three cases were excluded. One *A*-preference case was thrown out because the child said in explaining his choice: "I thought you were going to make me reach for that one [the *B* object]." In both of the other two cases the children responded ambiguously. Eleven of the remaining sixteen chose the *B* object.

Cage Experiment (II).—As previously noted, certain results of the choice-in-action experiments indicated that if *B* and *A* objects are identical, *B* is less likely to be chosen than if they differ. By way of testing this indication in a verbal-choice situation another cage experiment was conducted. Identical *B* and *A* toys* were used. Except for this modification the materials and procedure were the same as in the cage experiment which is reported above. Nineteen preschool and kindergarten children served as subjects.

The *A* toys were ranked above the *B* toys in 32 per cent of the tests, while in 26 per cent of the tests the *B* toys were ranked above the *A* toys.

It may be correct to conclude that, in general, if the discriminable characteristics (see page 379) or "goal qualities" of alternative accessible and obstructed objects respectively are such that they cannot be differentiated, it does not hold that the valence of the obstructed object is greater than the valence of the accessible object.

This finding becomes intelligible if it is considered that two alternatives, so long as the necessity of choosing between them precludes the possibility of getting both, are virtually equivalent to a single goal. They are indeed equivalent, it would seem, in being adequate to a satisfaction of the same need. Although the objects lie at disparate points in physical space, in the sense, at least, that contact with either would release tension in the same system, they comprise one region in the life space.

The child is to have, for example, *a* piece of red stick candy, so big. It is duplicated in a second piece that *is* more difficult to get. But the region which would function as a barrier, by obstructing a different *goal*—say, a green piece, not so big or bigger—is in fact only a different *means* to what is psychologically the one goal, the red piece. The child might say: "Since they are the same, there is no sense in making a choice between them," meaning, they are not alternative *goals*, and so no choice can be made. There is only one thing to *take*—not to choose—and therefore the child takes the one thing via the easier means, selection of *A*. It may be, in short, that, again, the structure and forces are as shown in Fig. 8.

Analysis of Findings in Verbal-choice Experiments.—The results of the verbal-choice procedures in which non-identical *B* and *A* objects were used are interpreted as supporting the hypothesis. And they are consistent with the deduction that the tendency shown by children to choose the accessible object in the choice-in-action situation was determined by a resultant of which the restraining force corresponding to the barrier was the dominant component. Thus, they leave open the possibility that in the choice-in-action situation, as, apparently, in the verbal-choice situation, the valence of the obstructed goal was stronger than the valence of the accessible goal.

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* A motorcycle and a multicolored ball inside the cage and identical toys outside.

The difference between the findings of the choice-in-action and the verbal-choice experiments may be clarified by an analysis in terms of the reality-irreality dimension* of the life space.

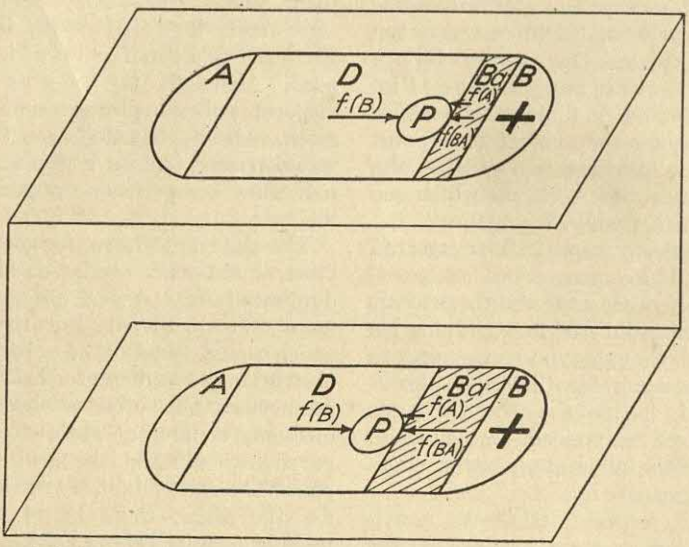

FIG. 9.—A choice situation including a barrier in which the resultant force on the level of reality is toward the accessible goal while the resultant force on the level of irreality is toward the obstructed goal. (The level of reality is represented on the lower plane.)

Overcoming an obstacle to *get* an object requires of an individual that he conform to things as they really are. This is a way of saying that choice in action of an obstructed goal is an event which must occur on the *level of reality.* The life space includes also *irreality levels,* which may be identified as the strata of things, not as they are, but as one would like them to be. Dreaming, hoping, and the like are ordered to planes of irreality. On the irreality levels, "one can do as one pleases"; *i.e.,* the mediums are relatively fluid; and this means, among other things, that on a plane of irreality *barriers are relatively weak.*

Only saying that one would like to have a thing (or that one likes a thing) probably should be construed as more irreal than getting it. And, as indicated previously, saying is *easier* than doing. These two points are brought together in everyday comments about behavior such as the following: "That's easy enough to say, but harder to do. *Why don't you be more realistic?*"

If characterizing the *mere* verbalization of a preference as a relatively irreal activity is admissible, and the previously submitted interpretation of the results obtained in the choice-in-action experiments is correct, the structure and forces of the verbal-choice situation could be represented as in Fig. 9. On the level of reality (getting) the strength of the restraining force $f(Ba)$ corresponding to the barrier is such as to produce a resultant toward A. This is true even though the force $f(A)$ toward A is weaker than the force $f(B)$ toward B. The presumption is that if the child were asked to *get* either A or B he would choose B. (Suggestive at this point is the child's *explanation* for his selection of A: "I thought you were going to make me reach—"; see page 393.) On the irreality level there is a barrier, and so, in line with the hypothesis, again, the force $f(B)$ toward B is stronger than the force $f(A)$ toward A. But the restraining force is sufficiently lacking in strength that the resultant is toward B.

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* *Cf.* pp. 367–371, Chapter XXI of this volume.

Concluding Statement

The results of experiments reported here are interpreted as evidence that in a choice situation the valence of an obstructed goal is stronger than the valence of an accessible goal. Certain conditions under which the phenomenon is not demonstrable and other conditions which determine the degree in which it shows in choice behavior were revealed. The findings proved to be subject to internally consistent analyses based mainly on the concept of a resultant of psychological forces.

Differences between the behavior of children and adults in objectively similar situations were observed. It was shown that, in fact, the dynamics of these situations were not the same for the child as for the adult. This obviates the necessity of explaining the different ways of behaving in terms of different "principles"; but it leaves open the possibility that the differences may have been due in part to changes with development in the structure of the person.

TOWARD A THEORY OF THE LESSER VALENCE OF *A*

In the experiments the individual confronts not only an obstructed goal (B) but also an alternative accessible goal (A). Actually, this would seem to be true of any field that includes a barrier. There is grass on the other side of the fence; but there must also be grass or something on this side.

The region of a goal, like every part of the life space, has a certain *scope*. It is not a point. One may distinguish in it central and outlying or peripheral parts. It follows that entering or going through a goal region is not an all-or-nothing affair.

Consider the following cases. The distance runner mutters when he nears the tape, "Just as good as there." As the Statue of Liberty breaks the horizon, the returning American says, "Home at last." The football player boasts, "It's in the bag," when, at the end of the first half, his team is well ahead. In each instance the person may be represented as included in an outlying part of an accessible goal region.

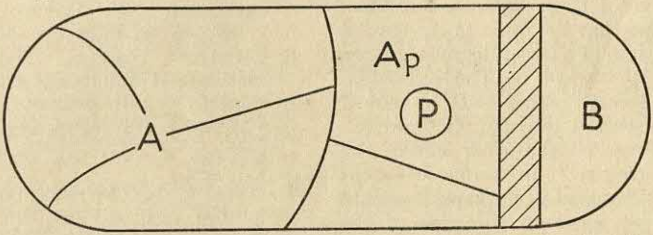

FIG. 10.—A choice situation in which the alternatives are A and B, and P is included in a peripheral part, Ap, of A.

It is proposed that *any accessible goal region* is to be characterized structurally as one including the person in a peripheral part of it. If this is correct the structure of the situation containing obstructed and accessible alternatives could be represented by Fig. 10. P is in a peripheral part (Ap) of A: the near thing (piece of pie, piece of candy, ball, toy) is "just as good as had." However, the central region A, actually taking the near thing, lies ahead.

Now, Lewin (11) postulates that a condition necessary for the existence of a force toward a goal (G) is a separation of the person and the goal region: a force at G toward G is equal to zero, whereas a force at a *foreign* region X toward G is greater than zero. Here, it is postulated further that a force applied in one part of a goal region G toward any other part of G exceeds zero in a lesser amount than a force toward the whole of G which is applied in a foreign region. (It may be that this would not hold for certain cases which cannot be examined here.)

At *Ap* the positional relationship required for the existence of a force toward *B* is met. *Ap* and *B*, the region of the obstructed goal, are foreign: *Ba*, the region of the barrier, lies between *Ap* and *B* (Fig. 10). There is then a force the strength of which is greater than zero at *Ap* toward *B*.

Since *Ap* and *A* are parts of one goal region, whereas *Ap* and *B* are foreign, it follows from the consequences indicated above of these *differing positional relationships* that the force at *Ap* toward *A* exceeds zero in a lesser degree than the force at *Ap* toward *B*. The individual locomotes toward (chooses) *B*. In view of what is observed directly, the proverb states, "Grass on the other side of the fence is greener." In terms of what happens dynamically, perhaps it should be said that grass on this side of the fence is less green.

In line with the theory is the finding by Hull (7) that a rat, when it approaches the end of a straight alley maze, *i.e.*, enters a peripheral part of the goal region, shows a marked retardation in speed of running. A similar finding has been obtained in experiments with children (17).

Essentially the same treatment can be stated in terms of tension systems: Corresponding to regions *A* and *B* there are states of tension in systems of the person *A* and *B*. The tension in system *B* is held constant by the barrier. The tension in system *A* is partially released because *P* has entered a peripheral part of *A*. Therefore, the tension in system *B* is greater than the tension in system *A*, and it follows from the dependence of valence on tension (see page 379) that the valence of *B* exceeds the valence of *A*.

Originally, in the research, the hypothesis was stated, "A barrier enhances a positive valence." If the analyses outlined in this addendum are right, it would be better to say of the barrier only that it *maintains* a valence.

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CHAPTER XXIII

EXPERIMENTS IN SIBLING RIVALRY*

DAVID M. LEVY

Purpose and Method

It is necessary to state at once the particular conditions under which the experiments that are described in this chapter were performed. Originally tried out on a group of children in a child guidance clinic, they were continued in private practice. This implies definite limitations. The fact that the experiments were part of a treatment process required various modifications which would have been unnecessary if the mental health of the child had not been constantly in view. For example, when a child showed evidence of anxiety at any time in the experimental situation various devices were used to allay it. Postponement of trials for weeks or months ensued in some cases. Further, when the child, for any reason, turned away from the experimental situation into other activities, he was, in most instances, encouraged to do so. Once the experiment was started the child was allowed to add material, in fact, even to change the pattern of activity.

The experiment presents a "control situation" which depicts to the child by the use of dolls a mother nursing a newborn baby. Three trials are conducted. In each, certain statements are made by the experimenter for purposes of introduction and to keep the action going. These remarks are the same for the three trials. In the fourth and later trials a comment is made for the purpose of stimulating attacking behavior. Typically the child shows evidence of animosity to the baby in one or another of the first three trials, so that the "hostility-provoking phrase" brings into action a feeling that is already there.

The rigid requirements of the laboratory experiment are not met in this control situation by reason of the limitations already described. The only elements that appear to be definitely determined for each subject are the use of the same material at the start, the same initial remarks, the same technique in stimulating activity and provoking attacking behavior. Beyond this, the framework of the experiment is loose. There is no strict adherence to time factors, no control of material beyond the initial stages or of extraneous activity. The laboratory type of investigator might indeed regard the sibling-rivalry experiments as a conglomerate of variables too loose to deserve scientific labor.

Actually a study of responses to the sibling-rivalry situation shows a definite uniformity of procedure. It is not difficult to follow the lines of action and investigate the principles underlying their direction. The repetition of the experiment serves in good stead. Each child, no matter how he proceeds, is brought back again to the same start. We can compare the different routes he takes and the progress he makes with his particular modes of procedure. When activated for the purpose of releasing his feelings in the control situation, we see in his behavior the forward movements of his previous line of attack. We note his ways of dealing with the impulse to attack; his denials, evasions, or attempts to escape from the situation. When he makes contact with the baby doll, or any other object, we note his method of attack—if direct, inhibited, shunted, and so forth. In short, we study the movements and the interferences with them at every phase of the activity. In this research, therefore, the facilitation of behavior is an integral part of the method, the elaboration of data a necessary consequence. The purpose is not, as in a laboratory procedure, to reduce the variables to a minimum; rather, it is to multiply the responses, provided only that they are initiated in the same setting.

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* From a monograph by the writer (1). Adapted with the permission of the American Orthopsychiatric Association.

The question in methodology—can dynamic processes be demarcated without curtailing the activity by too rigid control?—may now be answered by describing the technique and illustrating its application in a few typical samples.*

The patient is told that we are to play a game. For the game we need a mother, a baby, and an older sister (or brother). We use the amputation doll† to represent the mother, a celluloid baby doll (called brother or sister according to the sex of the true baby), and a larger doll for the older sister of brother (depending on the sex of the patient). The examiner says, "The mother must feed the baby." He then points to the chest of the amputation doll and says, "But she has no breasts. Let's make some." The examiner shapes one breast only of clay, the child shapes the other. This procedure is employed to facilitate the experiment, since some children are hesitant about making breasts but do so freely if the examiner makes one first. After the breasts are placed in position on the mother doll, the baby doll is put in the nursing position, the mother's arms encircling it.

The examiner then says, "Now this is the game. The sister [or brother] comes and sees a new baby at the mother's breast. She [or he] sees it for the first time. Now what does she [or he] do? Do whatever you think." The child is encouraged with such phrases as, "Go ahead," "Don't be afraid." The experiment may be repeated several times.

After the control situation has been utilized in this way, the examiner may then stimulate activity in various ways. These methods of releasing the rivalry are described in the individual cases. They consist largely in using such sentences as, "When the sister [or brother] saw the baby she said, 'That bad, bad baby, at my mother's breast!' "

Illustrative Cases

Case 1.—Our first example is taken from an experiment with a three-year-old girl, referred for treatment because of thumb sucking.‡ The type of problem is sufficiently mild to indicate that in this child, as in many others of the series of 127 children§ who have participated in the experiment to date, we are dealing with a "normal." Nevertheless, several examples of control cases (presumably normal children not referred for treatment) were included.

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* For further details, see the writer's other papers (1, 2, 3).

† The "amputation" doll is a small artist's manikin made of thin steel (length, 8 in.). The head, leg, and arm parts are detachable. A celluloid doll was selected for the baby doll because it is easily destroyed and is economical. A rubber doll was selected for the brother or sister doll because celluloid dolls of that size could not be readily obtained.

‡ Given as Case 1 in *Studies in Sibling Rivalry* (1, pp. 72–75).

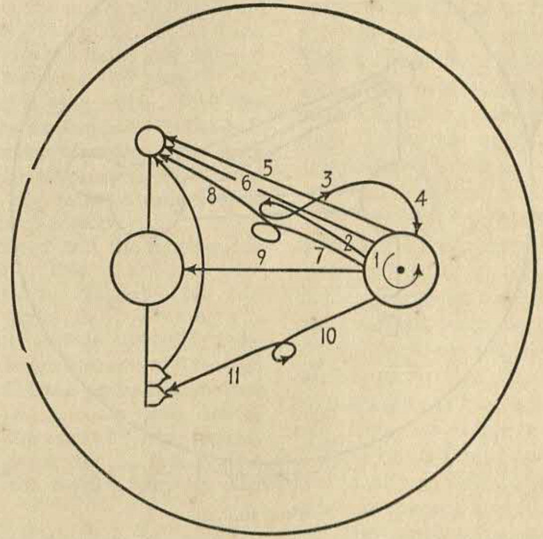
§ Of the 127 children, there were 79 males, 48 females, the age range being two to fourteen years. The minimum number of experiments per child was three.

The three-year-old was the younger of two, the older being a boy age four and a half years. In relations with her brother she appeared affectionate and admiring. She was his "echo," following him around like a pup and imitating everything he did. The experiment was a good example of typical mechanisms, and it illustrates the response of a child who, though actually the younger child in her family, plays the role of the older in the experimental play situation.

After she had wandered around the playroom for a while, the child was shown various toys and also the amputation doll. This was demonstrated to her. The drawers in the various cabinets were open and she was allowed to browse at will. After about 15 min. the experiment was started, with comment by the experimenter as noted above.

Experiments; Case 1.

Trial I: In reply to the question, "Now what does she do?" the patient said, "I don't know." (1)* Her hand moved slowly to the baby doll, almost touching it (2), then she went on to play with her toy automobiles (3), with which she had entered the room. In a few minutes she returned to squash the sister doll (4), and said, "She's bad. She was bad, now she's good." (Why was she bad?) "She wanted to take the baby away." (Go ahead.) She took the baby doll away (5). She said, "She can stand," then let it drop (6). (What did the sister want to do with the baby?) She made a move as if to throw it down, then stopped (7). (Go ahead.) She threw it down (8). She then took the mother doll apart (9), made a move to squeeze the breasts, and again stopped (10). (Don't be afraid. Go ahead.) She took the breasts, squashed them (11), said they were pancakes, and put them to the baby doll's face (12).



Trial I

FIG. 1*a*.

Trial II: The patient removed the baby, joined its hand to the sister doll and said, "She takes the baby for a walk." She made both dolls walk, then picked up the baby doll, adjusted it to the breast, and said, "She put it back." She then tried to make the sister doll stand up, picked up the mother, removed the baby—all movements gentle—started amputating the mother doll and said, "I'm going to put them back in." After complete amputation she said, "See, doesn't she look funny that way?" She then put the mother doll together again and said, "I can do every one, can't I?" then ran away and said, "The snake is going to bite me." (I asked why.) She said, "Because he has a mouth." She came back, laughed, and said, "Make a big long one," then said, "The snake will creep up your back. Real, real, real snakes go in floors, don't they?" At this point she heard an ambulance siren and looked out the window.

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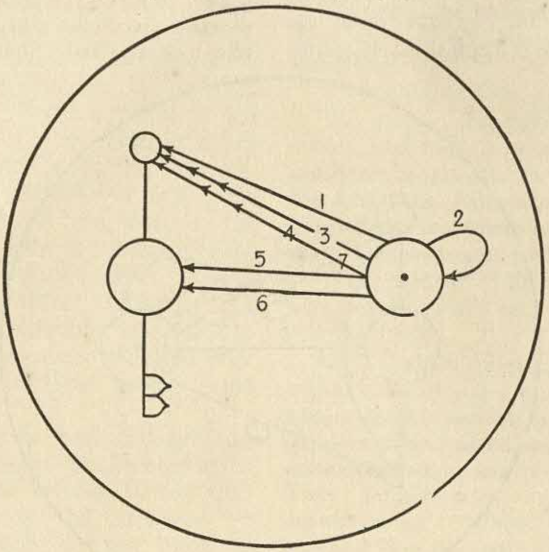
* Numbers in parentheses refer to the graph. Remarks by the experimenter are placed in parentheses.



Trial IV

FIG. 1b.

She then removed the breasts, saying, "I make a big cake, I feed the baby with the cake. Babies like cakes, don't they?" She pushed the clay to the baby doll, then pressed the clay flat on the board. She then took the mother doll apart and put it together again. All her movements were deliberate and well executed. She stopped before she was through and pressed the clay, then went on joining the mother doll together. Before inserting the final pieces she stood up and pranced about the room. She finished the job, then kept prancing about, and to my question said that she wanted to go to the toilet. She returned and played with the mother doll, saying, "She's doing a somersault. I stand on my head, too."

Trial III: "She stands up and she makes a cake." The patient took off the breasts, squashed them, picked up the baby, and said she was going to be a big girl. "I can make snakes out of clay. Look, I can make a big one." She laughed and rolled the clay into a snake,

Trial IV: (Attacking behavior was activated by saying: "The sister said, 'The nasty baby, the bad baby, at my mother's breast.' ") She took the baby off (1), stood up and kicked (I thought at the mother and baby), and the foot struck the sister doll (2). She then said, "The sister said nasty, nasty, nasty." She stepped on the baby doll (3) at first slowly, then again and again, saying, "I step on it with my two feet." She then pulled a leg hard (4). "The baby is all broken again." She picked up the crushed parts, pulled them to bits, and said, "I broke the baby. I took the leg off. Look. All that was stepped on. All of it." She continued pulling the parts to bits, then picked up the parts and said, "Anyway, we have another baby. Have you a hard baby here?" (The doll was made of celluloid.) "Anyhow we can't have two babies at a time in one house. One house can't have two babies. Two houses can have two babies in it. Anyway, we can't have this baby, can we?" She scattered the parts. "If we had two houses we could have two babies. So one of the girls stepped on all the parts of the baby, but anyway we can have another one. The baby said to me, you ought to put the head on, but no, I can't put the head on." She tried to fix a head part.

She then took the mother doll and said she was scraping the black off the hand (5). She picked up the hand and dropped it down (6). She piled the parts of the baby together, saying again, "All the parts of the baby are broken. I'll step on it some more because it needs a little more step on it." She stepped on it (7) and walked away. She returned and looked especially at the face part.

She took a board, put the mother doll on it and said, "This is a boat." She then came back to the baby doll and gathered the parts again. I brought a basket without saying anything. She dumped the parts in and said, "There go the dead parts." I then gave her another doll to overcome anxiety and asked, "What about the sister?" She replied, "She's lying down for a rest." The patient ended the session playing with a truck.

Comments.—The child seemed overly disciplined. She asked permission to open the drawers of toys even after she was told it was all right. In Trial I restraint is seen in all her movements—a touch, then a withdrawal; hence the frequent need of encouragement. ("Go ahead.") As indicated by the later patterns, one may infer that her first impulse was to destroy the baby and then the mother doll. She barely touched the baby and then ran into distracting play. She returned to squash the baby but instead attacked the sister doll, because the sister "wanted to take the baby away." Put in terms of motivation, she attacked herself because of her "bad" impulse. Nevertheless, the attacking impulse proceeded. She did take the baby away and let it drop, an act of restraint far short of the later completed destructive performance. She went through the movements partially of throwing the baby down, stopped, and then, when encouraged, did throw it down.

With this increase in release of hostility, she attacked the mother doll by amputating her. The destructive activity directed toward the breast was partially checked. First there was the amputating and then a withholding of the movement to squash the breast. This withholding movement may have had other motivations; *e.g.*, she may have only been refusing to handle dirty clay. It may be regarded as a checked destructive movement consistent with previous patterns (*e.g.*, touching the baby followed by squashing it; talk of taking it away, then later doing so; "letting" it drop, then throwing it down). However, resemblance to previous patterns may be fallacious. Any object stuck on another is invariably pulled off in the play sessions. That such activity is hostile may be inferred only from the sequence of events.

Trial I and Trial IV may be depicted graphically as follows. The lines of the graphs represent hostile, self-punishing, and "preventive" movements. Restitution and defensive behavior are not represented. The child, the "self" (brother or sister) doll is represented by the circle on the right; baby, mother, and breasts, in that order, from above downward, on the left. Description of the acts represented by the lines of the graph can be followed in the text of the trials, where the corresponding numbers are indicated. Note the simplification in Trial IV as compared with Trial I. The lines of action have become direct. Excepting for the "self-punishing" maneuver, there are no inhibited movements, escapes into distraction, or other inhibitions to the act.

Patterns of Hostility.—A classification into four categories (as given below) of all activities of the subject, including verbalizations, was made after each set of experiments. In this series, as in others, every word or movement that interrupted or delayed ongoing attacking behavior was listed under "Prevention of hostility to objects in setup" (*A*). Four types of prevention of hostility occurred in this case: denial, inhibited movement, distraction, and escape or "flight."

The sequence of attack on the objects in each experiment was listed under "Direction" (*B*). In this case the subject, in the first experiment, attacked the self doll, then the baby doll, the mother doll, and the breasts. In the second experiment she attacked the mother doll, then the baby doll, and finally the breast. Usually such sequences repeat themselves. In this case the direction of attack from one object to the other was repeated (excepting attack on the breasts) in the first and fourth experiments.

The methods of attack on each object and their sequence was listed under "Forms" (*C*). Note the forms of attack on the baby. They start mildly—touching, removing. The attack becomes more serious—dropping, throwing. It becomes violent—crushing, tearing.

All words or movements indicating criticism or punishment of the subject or self doll were listed under "Self-punishment and accusation" (*D*). In this case the subject criticized the self doll for attacking the baby, saying, "She was bad." After attacking the breasts she said, "The snake is going to bite me," interpreted from the sequence as possibly a revengeful act, because of her attack.

All acts or words that represented attempts to undo the damage or hurt to the objects by restoring, or attempting to restore, or make amends, or even promising to be good, were listed under "Restitution" (*E*). Four representative acts of "restitution" occurred in this set of experiments.

Various forms of self-defense used by the subject to justify or excuse the activity in the experiments at any point were listed under "Self-defense" (*F*). Of the six types of self-defense used in this case, the fourth is the only one that may be questioned as rightly belonging under this heading, since it represents a request for the examiner's reassurance that the subject will not be attacked. It may signify a fear of retaliation and so might be listed more properly under *D*.

PATTERNS OF HOSTILITY

A. Prevention of hostility to objects in setup.
   1. "I don't know" (denial).
   2. Touching and withdrawing (inhibited throwing, inhibited squeezing).
   3. Going into other activities (escape into distracting play).
   4. Leaving room (escape).

B. Direction.
   1. "Self," baby, mother, breasts.
   2. Mother, baby, breasts.
   3. Breasts, examiner.
   4. "Self," baby, mother.

C. Forms.
   1. Baby: (*a*) touching; (*b*) removal from breast; (*c*) dropping; (*d*) throwing; (*e*) pushing breast to baby; (*f*) crushing with feet; (*g*) pulling apart; (*h*) scattering parts.
   2. "Self": (*a*) squashing (crushing with fingers); (*b*) verbalization: "She's bad"; (*c*) kicking.
   3. Mother: (*a*) general amputation; (*b*) distortion; (*c*) scratching; (*d*) amputation of hand.
   4. Breasts: (*a*) removal; (*b*) squashing; (*c*) pressing; (*d*) manipulating.
   5. Examiner: "The snakes will creep up your back."

D. Self-punishment and accusation.
   1. Self-accusation: "She was bad."
   2. Retaliation of breast (?): "Snake is going to bite me."
   3. "The baby said to me, 'You ought to put the head on.' "

E. Restitution.
   1. Relating to "self": "Now she's good."
   2. Relating to baby: Put back to breast. "She put it back." Tries to put parts together again. "Baby is all again." A new baby.

   3. Relating to mother: Put together.

F. Self-defense.
   1. Justification: "One house can't have two babies." "Anyway, we have another baby." "It needs a little more step on it."
   2. Appeal to examiner: "Anyway, we can't have this baby, can we?"
   3. Impotence: " . . . but no, I can't put the head on."
   4. Against harm: "Real, real, real snakes go in floors don't they?"
   5. Promise of restitution: "I'm going to put them back in (parts of mother doll)."
   6. Mothering: Feeding baby. Takes baby for a walk. Cake for baby.

Case 2.—The next example is taken from a boy age three years and eight months,* who was actually the older of two children, the "rival" a sister age twenty months. He was referred because he still retained his baby speech, which he had been outgrowing until the birth of the sister. Physical examinations showed no evidence of organic disease or of special hearing difficulty. The baby speech was considered a regressive response to the birth of the baby. In his relationship with her there was no overt hostility or any especially disturbed behavior at the time of first meeting. The experiment was started in the first interview, after the usual familiarization with the amputation doll and other toys in the playroom, as described in the first example.

Experiments; Case 2.

Trial I: (Usual introductory sentences.) The patient appeared very interested, then took the brother doll and made him walk to the mother. He then said, "I don't want to," cried a bit, said "I don't want to," several times, then, using the brother doll as a weapon, smashed the mother doll, threw the baby down, and looked at me anxiously. (That's good. Go ahead.) He then took the baby doll (a china doll), smashed it to bits, and said, "Why did you tell me to smash it?" (Because you wanted to.) He took every large bit of the doll and smashed it with a stick, then with a hammer into smaller bits. Then he took the mother apart and struck her with a hammer. He removed the breasts, squashed them, then put them on the brother doll (a rubber doll), and then hit the rubber doll, saying, "I can't break it, it's rubber." (Why are you hitting the brother?) He didn't answer. He then insisted on having more baby dolls. He smashed another and, after getting a third, said, "No, that's a pretty one." He then got distracted and played with animal toys.

Trial II: (Usual introductory sentences.) He said, "I don't know." He then took a toy automobile and said, "It's the mommy's automobile." He picked out another doll and said, "Where did you find it?" He asked for the hammer. He then picked out a china doll (in Trial II a celluloid doll was used for the baby) and smashed it to bits. He said, "I broke that baby up," and sang, "I broke that baby up." He found another doll and asked, "Can I break this one?" I said yes. He smashed it again with a hammer and said, "That's very hard," then, "Now I break the head, and now I broke that up." He then became distracted and could not be led to the sibling-rivalry play.

Trial III: (Usual introductory sentences.) The patient refused to play with the material.

Trial IV: Trial IV took place in the sixth interview. He kept away from the sibling-rivalry material for three interviews, meanwhile playing chiefly with water and baby dolls, wetting their "diapers," washing them, and so forth.

When showing him the sibling-rivalry setup, I said, "The brother (using the patient's name) says it's a naughty baby." He jumped on the mother and baby doll, squashing them. He removed the breasts. He then carefully put the mother doll together again, got another baby, and tried putting the mother with her arms around the baby exactly as placed originally. He then went on to other play.

Trial V: (Seventh interview.) The patient played chiefly at putting diapers on the babies and wetting the diaper. He would not come near the sibling-rivalry setup. He took as many things as he could get, every truck, and every little animal figure. He dumped them all in a wagon. Then he stuck lumps of clay in water, took them out, and put them on trucks. He ran the trucks, took out the clay, and made the trucks bump one another. He then ran them to the sibling-rivalry setup, which was placed on the floor, and ran over mother and baby. He lifted the trucks to hammer them down, then crushed the brother doll, and then rolled the trucks along and crushed down the clay.

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* Case 4 in *Studies in Sibling Rivalry* (1).

Trial VI: (Eighth interview.) During the patient's play, consisting mostly of putting marbles in a glass of water, then pouring the water from one glass to another, getting as many trucks as he could into the playroom, I added three baby dolls to his material. In pouring the water he got a lot of it on the table and on the floor. Then suddenly he pulled the arms and legs off the dolls, looked flushed, and threw them at me. He laughed and said, "What is that for?" pointing to some books. (Why did you throw the babies at me?) "Because you wanted to eat me up." He then took the torsos of the dolls, broke them up with his fingers, and put all the parts together in a glass of water, then said, after a few minutes' play in silence, "Now we must have a dinner," and enumerated the parts of the meal. "You must have some." He gave me the parts of the doll in a glass. I took some and we both put them in our mouths. Then suddenly he said he wanted to do "wee-wee" in the glass that contained the parts of the doll and quickly prepared to do it, though I did not let him. He struggled but I finally got him to the toilet.

Case 3.—Another example is that of a six-year-old girl, referred because of fear of any change in her daily schedule, of strangers, of going shopping or to a party or restaurant, and so forth. She was excessively neat and clean. The patient was the oldest of three children, the next younger, the "rival," being a boy of four, with whom, however, she had no apparent difficulty. The experiment was tried in the first interview.

Experiments; Case 3.

Trial I: She advanced the sister doll to the baby, touching it. (What does she do?) The patient replied, "She kisses the baby." She removed the mother-baby combination, put the baby in a chair, removed the breasts and flattened them. (You put baby in the chair.) She replied, "And I'll leave her there all alone." She flattened out the breast, made "a lady" out of it, and described the details of the construction. She said "I'll put legs on her so they'll not come off." She continued working with the clay and said, "And then the little baby will think it's real. It's going to the little girl and say, 'Hello, little girl. I'm very new. I'm just new. I've just been made. I'm a clay girl.' " She put clay on the mother doll, calling it "a dress."

Trial II: The patient began, "She says, 'Where's that baby come from, that big baby. Well, I like to see that baby.' So she takes it off her breasts. She's going to do it herself. So the mummy gets off the chair and says, 'No, you can't. You are a little girl. You might drop the baby.' " The patient put the sister doll in the mother doll's arms, then put her in a chair, and added "The chair falls down." This was demonstrated. "The mummy says, 'Don't do that. Little girl, please stop tumbling down the chair.' " (Why did she tumble it down?) " 'Cause she thought it was funny." She then remarked on a drawing on the wall and drew a girl.

Trial III: She said, "Where did that baby come from? I don't like that baby so much." She removed the mother doll and put the baby doll in a chair. "The mother is going to take off these things." She removed the breasts and made "a big mummy snail."

Trial IV: (Attacking behavior activated.) The patient said, "She says, 'Send him back where you got him, 'cause I don't like him. You must go back now quickly.' " (Where?) "Back to the hospital to get another baby 'cause she doesn't like the baby. So she takes the baby and puts her to bed." She took the baby from the mother doll and put her on a flat piece of clay. "The mother says, 'Look at the baby asleep.' I think I'll take apart the mother." She amputated the mother doll and removed the breasts. "This mother here doesn't know which part is hers, how to get herself together again. The sister says, 'Well, mother, you look pretty little, littler than me.'" She put the head of the mother doll in a chair, and went on, "The sister says, 'You look like a baby.' Mother says, 'You can't do to yourself like this.' The sister says, 'I don't care.' Now we're going to make a very funny mummy." As she reinserted the parts, she said, "Mummy says, 'I'm getting bigger and bigger. How do you like me now?' Not good yet." She inserted more parts. I asked how she wanted to do it before. She replied that she wanted to put the head here, pointing to the arm. I helped her do it. She said, "What a funny mummy," then removed the head and correctly reinserted the parts, but before inserting the hands and feet, she said, "I want to spill water on the floor." She went to the sink and did so with a rubber bulb. There was much laughter. She said, "This is a cute little corner to do my tricks, squirting water on the floor. People will come in and say, 'Look at the puddle of water here.' I can hardly go in myself. I like to do this trick. I'd like to do it in the country. I'd like to do it on the flowers. I'd like to do it on someone's neck." Meantime there was much laughter. She dashed water on the wall. (Whose neck?) She said, "Bobby's (brother's). I wouldn't tell Bobby about this 'cause he'd do it at home on the floor." She spilled water over the floor, then took the sister doll and gave her a bath.

Trial V: (Usual stimulus.) "She says, 'I do not like that baby and I wish he could go away. If you don't take that baby where you found it 'cause he's not a nice baby.' And the mother said, 'Well, I think that's a nice baby and I'm going to keep him.' So the sister said, 'All right, mummy, you may.' And the mummy said, 'You go to bed.'" She removed the mother doll and baby from the chair and put the baby doll to bed. She then put the mother doll in a drawer, saying, "We don't want her." She removed everyone except the baby and a "cook." She then added a "sister." She rummaged in a drawer, found a broken knife, dug it in the toy cabinet, laughing, and said, "We couldn't do it at home; mama would be angry. This is a special place, isn't it?"

Summary and Discussion

Whether age three or thirteen, children disclose remarkably similar dynamics of behavior in the sibling-rivalry situation. Each set of experiments shows a more or less complete representation of the lines of activity enumerated in the three examples given. The greater the number of trials the more inclusive are the patterns to be described.

All the behaviors observed as withholding attack on the objects may be considered under the heading: "Prevention of hostility." They are comprised of four types:

I. Movements blocked (inactivity).
II. Movements away from object (escape).
III. Movements toward object, partially released (inhibited movements).
IV. Movements directed to object and shunted off (shunted movements).

When there is difficulty in classifying any item of behavior in one of the groups described, the sequence of events is used as a basis for its determination. When, in any particular case, a gap occurs in a sequence which in other cases is completed, the meaning is implied. The basis of interpretation is then inferential; *i.e.*, one assumes that if the sequence had gone on without interruption it would have taken the form observed in the behavior of those children who had frequently completed such a sequence. The assumption is the same in the case of a child who repeats three out of four acts in a logical sequence in the first, second, or third trials, completing the chain in the fourth trial. Since the objectives in a given line of activity are clearly revealed, it is easy to infer how events would proceed if restraint on action were removed. For example, a child shoots at an object in the first trial. He hammers it with a hammer in the second trial. He shoots again on a third trial. Further trials do not take place. It is inferred simply that if they did take place, the attack would become one of handling the object directly, crushing it with the fingers, stamping on it with the feet, or biting it, since that is the final form taken by similar patterns in repeated trials.

Since the "preventive movements" are presumably indicators of anxiety in releasing the attack, a study was made of the difference in behavior in the experiment of children displaying overt hostility to the baby at home and those having no overt evidence of difficulty. It was found that the number and variety of preventive movements were greater in children having manifest difficulties in the sibling relationship. Presumably they showed more anxiety in their response to the baby doll in the experiment.

When a child begins to attack an object in the setup it is interesting to follow the procedure in the different trials. Since the breasts are detached and attacked as a separate entity, we have only to follow the play of hostility as it passes to the baby, mother, breasts, and brother or sister doll. Our first three-year-old, in the example given, always started with the sister doll, *i.e.*, the "self," before going on to other objects. In Trial I, as described under "Patterns of Hostility," the route taken was "self," baby, mother, breasts. In the second trial the route was mother, baby, breasts; in the third trial, breasts, examiner; in the fourth, "self," baby, mother.

Generally there is a fair degree of uniformity in the routes taken in the different trials. When a change occurs its meaning is often clearly revealed. Thus, where a child has always followed an attack on an object by an attack on the self doll, and in one of the trials the examiner is attacked instead of the "self," the meaning of the act is more easily comprehended because of the fact that the examiner was attacked at a point in the sequence appropriate for an attack on the self. The interpretation made is usually that the attack on the self doll (actually the child may slap its real self) represents a retaliatory self-punishment for attacking another object. The child punishes itself because it is blameworthy. When the examiner is attacked instead of the child, the reason assigned for the attack is that the examiner was regarded as blameworthy. This is frequently verbalized clearly. Detailed study of the experiments described in the literature will indicate that the word "self" is used advisedly, because of the child's identification with the attacking doll. That the order of attack is not haphazard may be determined by certain relationships between the objects attacked and the previously known responses of the child in the actual sibling-rivalry situation.

The manifestations of hostility vary from slight movements to primitive crushing, biting, and tearing apart. The material used, however, places certain limitations on the kind of hostility displayed. A celluloid doll was selected for the baby because it could be easily torn apart and crushed and bitten. The mother doll, made of steel with head and limbs joined by a ball-socket arrangement, cannot be handled in this manner. The release of hostility on the mother doll is more likely to be in the form of amputation and scattering the parts, though attempts to crush it sometimes are made. The commonest form of attack on the mother doll is amputation; the commonest form of attack on the baby doll is to crush it in some way. The clay breasts invite removal and squashing, though every variety of hostile play is seen. Children tend to remove any stuck-on object. On one occasion I prepared dolls with clay stuck on at various points of the body. They were always removed, as though they did not belong to the object, by the two children on whom the experiment was tried, without evidence of hostile behavior. Sticking clay on a doll may represent to the child a distortion of a familiar object. In the experiment, the removal of the breasts is regarded as a hostile manifestation, since it is followed in nearly every case by some other form of hostility—pinching, crushing with fingers, stamping with feet, tearing apart, and so forth. In the one case in which removal alone occurs, the meaning also is hostile, as shown by the play of events. Attack on the brother or sister doll is considered under the section on self-punishment and self-accusation. The brother or sister doll is a rubber doll and hence cannot be attacked in the same manner as the baby doll. This is unfortunate, because the hostility displayed on the "self" takes the form of hostility practiced on the object preceding; *i.e.*, the child attacks the brother or sister doll in self-retaliatory fashion according to the pattern of hostility on the baby. Since it is not a celluloid doll like the baby the retaliatory hostility cannot be identical. One child, after attacking the baby doll, eating and biting it, picked up the rubber doll and said, "I can't bite it." This illustrates the tendency to follow the identical pattern in the form of self-punishment.

Usually the forms of hostility are of a mild character in the first trials, with increasing release of hostility where primitive forms are revealed. The forms of attack have been classified into three groups: the first includes mild attacks like dropping, flipping, slight denting; the second includes simple assault like throwing, slapping, hitting; the third includes the primitive hostile forms like crushing, tearing apart, biting. Regardless of age, with an increase in frequency of contact with the material, there is generally greater release of hostility to the baby than to the mother or breasts. In the three- and four-year-olds it was found that children referred for feeding problems made the breasts the major object of attack.

The breasts stimulated more imaginative and symbolic activity than the other objects. They were called pancakes, snakes, milk, food, enemas, suppositories, dirt, and so forth. The interpretation of the symbols used, based on the sequence of events, was generally a transformation of them into other objects of food or into attacking objects.

The attack on the self doll, interpreted as self-punishment or self-retaliatory hostility, was as mild or severe as the hostility that preceded it. Sometimes self-punishment preceded the attack on the object. In general, when primitive hostility is released, three forms of activity follow: self-punishing, restoring, and verbal defense. When the attack on the object is mild, none of them may follow. The less severe the attack, the less severe the consequences to the "self" in terms of retaliatory behavior.

Restoring behavior, or restitution, refers to the activities that restore or attempt to restore the attacked objects to their original state. The child tries to undo what was done, in every detail. Breasts are manipulated into their original form and put back on the mother; parts of the mother are assembled and reinserted; the baby is put back to the breast. Since the material is such that the baby alone cannot be restored, a new baby may function as a restoration of the old one. Following an attack, either self-punishment or restitution may occur. Both actions are evidently an attempt to overcome the effects of the hostile display—in the one case by punishment, in the other by "making good." The three-year-old in our first example hits the sister doll and says, "She was bad, now she's good." The play of restitution follows, in general, the play of hostility. The most frequent instances of restitution consist in putting the baby back to the breast, reassembling the mother, and restoring the breasts to her. Most frequent is restoration of the mother. From this fact no special conclusions can be drawn, since the mother doll is so constructed that reassembling it is a natural part of the play. Sometimes a child refuses to assemble the parts, and says immediately after removing: "And I won't put it together again," or, "You'll have to do it yourself." The restoring behavior appears similar to the self-punishing behavior, in that the child acts as though he finds himself compelled and may try to prevent restoring behavior.

Restoring acts occur more frequently than self-retaliatory acts. They may occur at that point in a sequence of acts in which self-punishment frequently occurs. They may replace the latter type of activity or combine with it. They give the impression of being more satisfying to the child. On the other hand, restoring the baby often starts a new line of hostile attacks.

Under "Defense" are included all acts that represent attempts on the part of the child to defend himself against the consequences of his hostile behavior. They consist of justifications, denials, mitigations, or concealment of the hostile act; defensive measures against self-punishing behavior and the need of restitution. Defensive maneuvers of some form were used by every child in the series. Commonest are various forms of excuses (defense by the use of logic), utilizing the examiner to permit, approve, and share in the hostile play, and projection.

Defense may appear after self-punishment or restitution has taken place. It would seem that these mechanisms are then not adequate in themselves to "neutralize" the feelings resulting from hostile behavior. In some cases, the child definitely anticipates self-punishing and restoring and acts to prevent their occurrence; *e.g.*, by attacking the examiner instead of himself at the end of the hostile performance, or by saying he will not restore the object while attacking it. In general, the child who manifests a larger variety of restoring behavior manifests also a larger variety of defensive behavior. *In other words, as the number of hostile acts increases, there is generally a corresponding increase in the other forms of behavior.* In essence, the defensive maneuvers say: (*a*) "What I did is all right because you let me" (mitigation). (*b*) "Anyhow I had a good reason to do it" (excuse). (*c*) "Really I didn't do it at all" (concealment and denial). (*d*) "You're the one who did it" (projection). (*e*) "Anyhow I'll fix it up. No, I can't" (restitution defense).

The defensive maneuvers are typical of human behavior. They represent all the rationalizations used to defend oneself against the consequence of an act. They are the basic ingredients of the apology. The varieties are numerous. In general, they try to establish a justification for the act. They are used apparently not only to mitigate uncomfortable feeling ("guilt") but also to release further hostility. Concealment of hostility is often difficult to discern. According to the sequence of events it would appear that a number of questions the child asks represent a concealment or a deflection of hostility. Such an interpretation is made because in many instances the child asks a number of questions in the play and then has the mother punish the self doll. The explanation given by the child is that the mother punished it not for asking the questions but for its wish to attack the baby. A child may touch the breast in the play, asking the mother, "Is this more milk?" Its further activity indicates that the touch was a prelude to a direct attack. Kissing and mothering the baby may also conceal hostility, since often they are followed by an immediate attack or by an immediate denial of any intention to attack. It is as though the act says, "You see how good I am. I like the baby. I don't want to hit it at all."

On the other hand, such acts may definitely represent a display of affection or a true wish to mother. The mothering of the baby may also represent a rivalry with the mother, a wish to have a child also. This is not a subtle interpretation. It appears very clearly in a number of experiments. Sometimes the child gives another baby to the self doll, saying it is only fair that each should have one. Sometimes a child takes the baby away from the mother doll and gives it to the self doll, saying that the sister (or brother) is a better mother and should have a baby, and so forth.

One of the methods of defense is called "projection." By this is usually meant attributing to someone else one's own "bad" or "guilty" impulses. For example, a number of the children in the series attacked the examiner, after attacking the baby or some other object, with the accusation, "You made me do it." The attack was in the form of throwing the object at the examiner, hitting or blaming him. The examiner was used as a form of projected self-punishment. For example, one of the children threw at me the parts of the baby dolls he had torn up. When I asked him why he did it he replied, "Because you wanted to eat me up." Being eaten up was evidently a self-punishment for trying to eat up the baby doll, as he actually tried to do. He made me the punishing agent in this process, thereby identifying me presumably with a parent. After such protective devices are used the hostility may again be released, as though the "felt" consequences of the preceding acts had been relieved.

Regressive behavior refers to activity representing a return to an earlier mode of adaptation which the child had previously given up. In practice we frequently see a return to wetting or soiling, infantile speech, or sucking at the bottle on the part of the older child in response to the newborn baby, years after he had "graduated" from such performances. In the sibling-rivalry situations we see it expressed quite simply in the form of removing the baby doll and putting the sister or brother doll in its place, with the frank utterance: "I want to be the baby. I don't want to grow up." This particular mechanism, though apparently fairly common in family life, is not revealed as frequently in the experimental situations as one would anticipate. It seems to occur in children who are showing actual regressive behavior at the time of the experiment.

Frequently after completing one of the trials in the sibling-rivalry situation a child asks to be weighed or to be told how tall he is. There is a scale in the playroom that may facilitate this kind of behavior, but the point at which it occurs definitely follows an attack upon or derogatory statements about the younger sib. Presumably it draws attention to the child and is supposed to indicate that he is a much worthier object. It corresponds with the observation frequently made in family life that, when much attention is paid by grownups to the younger child, the older one starts showing off.

Little need be said in this paper about the therapeutic use of these experiments. The general observation should be made that a functional change in the actual sibling relationship is achieved, especially when hostility of the primitive type occurs, *generally unhampered by self-punishing, defensive, and restoring behavior.* In other words, a free release of hostile feeling in the experimental situation apparently has a beneficial effect on the actual sibling relationship in many cases. The proof of therapeutic function is best seen in observations made immediately following the experimental procedure.

In these experiments we may conclude that the motives of children can be revealed through activity in play situations, so organized as to satisfy the requirements of experimental procedure (the controlled situation) and yet sufficiently flexible to allow abundant variety of behavior. The meaning of this behavior can be determined by careful study of the sequence of events, considering the relations of the items of purposeful activity, as in any empirical investigation.

In play situations constructed to release the feelings of children in a sibling-rivalry experience, essentially similar patterns of activity appear that represent dynamic principles of behavior.* The child's response to the mother-baby combination, when hostile, is felt chiefly as an urge to destroy, by immediate primitive release of feeling in the form of biting, crushing, and tearing. Checks to this impulse are already manifest at the three- and four-year-old levels. They operate typically in the initial phase of the act, either blocking it or allowing only its partial release. Once hostile behavior is set in motion, it runs a well-defined course, felt by the child as a "push" or "compulsion" to act—along the prescribed lines of the pattern. Following the release of hostile feelings through an attack on the object, the child must pursue one of three kinds of self-redeeming behavior, of necessity all three if the hostility is to go on. They consist of self-punishment, equal in amount to the hostility displayed; of attempts to make good the damage done, by restoring objects to the prebellum stage; and of various defensive measures—lies, evasions, and justifications. As the full pattern unfolds, the child may resist at any point, anticipating and protesting the next move.

Checks to action are evidently derived out of fear of consequences, felt as a fear of the destructive impulse. Clearly, also, the "self-redeeming" behavior acts to allay the anxiety rising out of the destructive act and enables further hostility to go on.

The completion of such patterns of behavior affects the child's behavior toward the object of rivalry in a beneficial way, presumably by reducing feelings of hostility, thereby allowing the growth of other forms of response.

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* Two examples of "dynamic principles of behavior" derived from sibling-rivalry experiments follow. (*a*) Inhibitions to the hostile act occur at any phase; at the point of origin when the impulse is felt, during the early phase of discharge; during the later phase before the object is reached; and even at the end phase, when the act is consummated. (*b*) The freer the release of hostile impulses the more likely are one or more of the three "consequences" of the act to follow; *viz.*, self-punishment, restitution, and self-defense.

CHAPTER XXIV

CLINICAL STUDIES IN CHILDHOOD PLAY*

ERIK HOMBURGER ERIKSON

Introduction

Psychoanalysis not only assumes, with others, a vague self-teaching, self-healing function in childhood play, it also detects a detailed correspondence between central personality problems and both the content and the form of individual play creations. However, the clinical psychoanalysis of play has shared the methodological limits of other psychoanalytic mediums with which Freud did not concern himself in detail (as he did with dreams, slips, witticisms, etc.). The discernible phantasy content of play is welcome as a substitution for dreams and other mediums which are not plentiful in contacts with a small child; its specific variables, however (such as the variables of extension in actual space), have not been considered worth any special consideration.

How much or how little scientific ore may be contained in the clinical experience comes to light only through the therapist's constant efforts at making explicit some of the implicit (preconscious) steps of selecting, associating, and reasoning which constitute his clinical "intuition" at a given time and in a given technique. In this way, he delivers new problems to the doorsteps of more exact investigation. More he cannot claim to do, for his observation, if genuinely clinical, cannot avoid or measure powerful personal equations: beyond the fact that he observes with the naked eye and ear, he has the dutiful intention to influence the very material under observation, and this influence underlies the constant change of the therapist's function in science and society.

Let us, therefore, view only two short play episodes, and these as if they were contained in a moving picture which we can turn to slow motion or arrest completely in order to keep selected items before our eyes until we have finished saying what we have to say about them.†

Two Play Episodes

The Initial Situation.

Our patient is Mary. She is just three years old. She is described as not robust, rather a little pale, even timid; but she looks (and is) intelligent, pretty, and quite girlish. She is said to be dramatic: lovable, outgoing, playful, and coquettish if master of the situation; stubborn, babyish, and shut-in when disturbed. Recently she has enriched her inventory of expression by violent anxiety attacks which bring her to me: after being seemingly adjusted quite well to a play group (it is her first one and she has had extremely little contact with children), she began to scream uncontrollably until her mother came to take her home. This is paralleled by nightmares during which she strikes about

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† For the complicated methodology of play therapy and of child psychoanalysis, see the references and the bibliography.

> wildly. Her mother, on picking her up (in order "to hold her tightly") notices that her breath is "foul" and attributes the tension to bad tonsils. The nursery school contributes the observation that Mary has a queer way of lifting things and has a rigid posture; her tension seems to increase in connection with the routines of resting and going to the toilet.

With this information at hand we invite Mary to our office in order to see in what direction her play will point.

Every psychotherapist has certain vague expectations in regard to what a disturbed child entering his room for the first time may be expecting of him and may do. Against this generalized picture the behavior of a single child stands out in its dramatic individuality.

Our young patient usually arrives hand in hand with his mother. He can be expected to have made a mental note of the fact that our office is in a "hospital-like" institution. On entering the waiting room he finds a friendly secretary and is then invited into an inner room, about half of which (signified by "adult furniture") is set aside for the therapist's plainly nonmedical business, the other half (signified by floor space and an array of ordinary toys) for a child's play. He is told sooner or later that he is expected to let his mother withdraw to the waiting room and to allow the connecting door to be closed; the therapist and the toys are then to be at his disposal.

This situation confronts the young patient with a maze of conflicting possibilities. We should like to describe it as consisting of several overlapping fields of ambiguity which are created by the child's relation to mother, therapist, toys, and inner conflict.

There is first of all his *mother*. He may hold on to her hand or body, insist on staying with her in the waiting room, demand that the door remain open, or stubbornly remain near the door which has closed between her and him. If he does this, the situation is for him still related mainly to one goal, his mother, and through her the way home from a vague danger. This idea, however, is rarely unequivocally pleasant. Our small patient usually has reached a deadlock with his mother, who cannot understand why he does not "simply drop" his problem; while the home atmosphere, in which he has been subjected to varying educational methods, has become charged with unsolved conflicts. Thus, frightened as he may be, he feels attracted by the *doctor possibilities*, the second field, and one which offers possible escape from the unbearable pressure of the domestic situation. Something which the mother or somebody else has said usually has created a slight hope in the child that the therapist may be a person who understands the conditions and the tempo in which a symptom of fear can be gradually abandoned without giving place to chaos within or more trouble without. Many a child has learned also to expect that he will be able to play for time by repeating to this new therapist what has satisfied the old ones. On the other hand the therapist has been called a "doctor" and the medical implications of the surroundings add to the mere strangeness of the situation and create the expectation in the child that some kind of surprise attack is to be made on his physical or moral inviolacy. The mother, with the best intentions, often transfers the negative aspects of the mother field into the field of doctor possibilities; she insists, for example, on reporting in the child's presence latest developments, on admonishing or even threatening him, or on trying to secure the therapist's promise of diagnosis and advice. Literally and psychologically, therefore, the mother has to be referred to the waiting room; the child must feel that time has another quality in the doctor sphere, in which, paradoxically, there is no hurry about getting well.

In the meantime, a third ambiguous field has competed with mother and therapist in dominating the child's expectancies, *viz.*, the *toys*. For the child they open another haven, in which space too has another quality, and the therapist usually is quite glad to resign for a while in favor of this quasi-free sphere. Indeed, "what would we do without toys," has become a common exclamation now that we have relaxed our efforts to ignore this most natural tool. The toys evoke in the child that remainder of playful explorativeness which his neurosis and the present doctor situation has not been able to submerge; and, once he has started to select and manipulate, we can be sure that the temptation to play and to be the unquestioned and inviolable master in a microcosmic sphere will be great. However, we again see the child manifest hesitation. He has experienced too often the fact that the imagined omnipotence in the toy world only makes him feel his impotence the more keenly when he is suddenly interrupted by his worldly superiors. Playfulness does not rule until (and then only as long as) pressing purposes and fears have lost their compelling power. Thus the child often begins to play with hesitation, with selection, with one eye on the therapist or the door—but he begins to play.

Peace seems to reign. The mother is comfortably seated in the waiting room and has promised "not to go away"; the doctor has been diagnosed as a person who will not make surprise attacks on one's bodily or moral reserve; the toys, sure not to question or to admonish, promise a time of "unpurposeful" play.

However, it is at this point that the most dangerous field of ambiguity, *viz.*, the child's reluctance to confess and his need to communicate his *conflict*, takes possession of the peaceful situation. Whatever it is that drives the child—an urge to get rid of some past or to prepare himself for some future or both—the ever-present Gestalt of the life task which has proved too much for him appears in the metaphoric representation of the microsphere. It is here that our "sign reading" sets in and that the tools which Freud gave us become indispensable; for they make us realize that, in the playful arrangement which the child is driven to superimpose on the inventory of toys we offer him, he offers us an outline of the inner maze in which he is caught. Our small patients either show an anxious care in excluding this or that toy from their play or they work themselves toward a border line where they themselves suddenly find their own doings unsafe, not permissible, unworkable, or unsatisfactory to the point of extreme discomfort. They cannot go on playing in peace—a phenomenon which we shall call "play disruption."

If we temporarily neglect social connotations such as "play," "serious deed," "habit," "symptoms," etc., and instead concentrate on the *configurations* which often form the common denominator for the diverse symptomatic activities of a child, we find it useful to differentiate three spheres in which symptomatic behavior presents itself:

A child playing by himself may find amusement in the play world of his own body—his fingers, his toes, his voice, constituting the periphery of a world which is self-sufficient in the mutual enchantment of its parts. Let us call this most primitive area of play *autosphere*. Gradually objects which are close at hand are included, and their laws taken into account.

If, at another stage, the child weaves phantasies around the reality of objects, he may construct a small toy world. Blocks may serve as the building stones for a miniature world in which an ever-increasing number of bodily, mental, and social experiences are externalized and dramatized. This area of manifestation we may call *microsphere.* Wherever it is clear that an isolated object is used as a means to extend or intensify the mode of expression of an organ or an organ system and does not become a part of an extrabodily microcosmic arrangement, we call it an extension of the autosphere. Let us say a block if rhythmically banged against another block is a part of an autocosmic extension; while it would become a part of a microcosmic arrangement when, with consideration for its physical laws and its usual connotation, it is placed on another block so that together they may form a building. This building, a product of the manipulative-constructive faculty, may "represent" a body, but it is not any more a tool of any part of the autosphere.

We can term *macrosphere* that area of play in which the child moves as in a kind of trance among life-sized objects, pretending that they are whatever background he needs for his imagination. Thus he manifests his need for omnipotence in a material which all too often is rudely claimed by adults because it has other, "grownup" purposes.

Thus sections of the body, toys, and the body as a whole in its spatial relationship to the whole room or to the whole house may serve displaced impulses in various degrees of compulsive, naughty, or playful acts.*

We shall readily see that, especially for the disturbed child from three to six years old (the age range in our study), acting in the autosphere leads back easily into the sphere of regressive habits, while play in the macrosphere makes the child try out the environment in a manner both surprising and displeasing to attending adults. There remains then, by force of age preference and expediency, the microcosphere as a haven for overhauling the boats before taking further trips into the unknown. Our disturbed children approach this sphere, break down or hesitate before they reach it, experience a disruption in it, or suffer a belated disruption after having overestimated the omnipotence provided by it. The "sign magic" used during such behavior seems to us to outline where in the child's life the sphere of relative tolerance borders on the danger sphere of unbearable pressures.

Play Disruption. *Mary—Worker—Mother.*

> Mary holds mother's hand as she enters office. When she shakes hands with the worker (it is a somewhat rigid handshake and her hand is cold), she gives him a brief smile, then immediately turns her head away and from there on tries not to look at him. She turns to her mother, puts arms around her, and keeps her near the open door. While the mother tries to encourage her to look at the toys, she closes her eyes tightly, hides

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* Thus, a little boy, two and one-half years of age, who rather belatedly struggled against enuresis, expressed his wish to retain by taking boxes to bed which he held closed with both hands. His wetting gradually ceased. But, having sacrificed the eliminative pleasure, he began, before going to sleep, to throw objects out of the window. When hindered in this, he stole into other rooms and emptied bottles. Finally, finding his door closed, he showed himself "master of openings" by riding on the window sill. For a discussion of such "mode play," *i.e.*, the manifestation in the microsphere and macrosphere of organ modes (in this case retention and elimination), see the chapter "Zones and Modes" in (1). This chapter formulates pregenitality (Freud) as a system of successive combinations of organ modes (incorporation, retention, elimination, intrusion, and protective inclusion), orificial zones (oral-sensory, anal-urethral, genital) and contactual systems (tactual, muscular, locomotor). The successive cathexis of organ systems which seek the environment leads to the progressive mastery of the "outside" in combination with the progressive socialization of the "inside." This establishes in the growing organism an experience of the basic spatial modalities of organic existence; and it offers child training its most effective chance to condition basic cultural modifications of this experience (see 3, 6).

her face in her mother's skirt, repeats in a babyish voice, "Mommy, mommy, mommy."

Let us consider this item, which consists of a move toward and away from an object (here the therapist): a crude observational beginning, to be sure, but "natural" in view of our task to infer pathogenic associations from the selective attractions and aversions created by a standard clinical environment.*

A. Mary's verbal expression so far has been most primitive and babyish; it joins the evidence of the cold rigid handshake in denoting an anxiety which is clearly represented in her gross spatial behavior. Keeping near the open door, she clings babyishly to the mother's body (adherence) as if she wanted to hide in it, and excludes the worker to the extent of closing her eyes very tightly so as not to see him (encasement).

B. She first looks at me as if she wanted to see whether or not the new adult is going to understand fun. However, this feeler is quickly withdrawn. Her flight to her mother seems somewhat dramatic. I am not sure that she is not hiding a smile. It seems that she did not show any similar reaction either to the secretary or to a lady who spoke to her in the waiting room; does she react to my being a "doctor" or a man?

Mother and Doll.

Now Mary makes her first selection from the dolls. Pointing to a (girl) doll, Mary asks her mother several times, "What that, what that?" After the mother has explained that it is a dolly, Mary repeats in a babyish way, "Dolly, dolly, dolly," and suggests in words not understandable to the worker that the mother take off the dolly's shoes. The mother tries to induce her to perform this act herself, but Mary simply repeats her demands again and again without listening to her mother.

A. Mary's interest in the doll is not sufficient to overcome her mother adherence: she rather draws the doll into it, trying to make her mother play. The content of this play intention is that a mother dresses and undresses a girl doll's feet. Her speech remains babyish-repetitious.

B. We note the first play idea, concerning a girl doll's *feet*.

Interruption.

The mother begins to feel embarrassed since the hour is assuming the character of an observation of *her* play. She asks, therefore, if it is not time for her to leave the room and to wait outside. (The worker approves of her decision.) Mary does not show any signs of fear when, the adherence to the mother being thus broken up, she suddenly finds herself without anybody to lean on.

A. Mary is motionless and without expression.

B. Mary showed the same initial lack of anxiety when left by the mother in the nursery school. It seems that her anxiety typically remains latent for a while and that something specific must happen to provoke manifest anxiety. If we remain passive in a friendly fashion, she may produce that something herself.

Mary—Doll.

Her mother has left the doll in Mary's hand. Mary grasps it firmly around its legs. Suddenly she smiles mischievously, her face flushes, and she begins to touch various things in the room with the doll's head. When a toy falls from the shelf, she laughs and begins to push smaller toys, always with the doll's head, in such a way that they fall, too. Her excitement increases, manifested by chuckling and laughter. With special glee she pushes (with the doll's head) a toy train which is on the floor in the middle of the room. As one car overturns, she overturns them all. But as the engine overturns she suddenly stops and becomes very pale.

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* Following this and the other items of behavior we shall try to characterize in paragraph (*A*) four aspects of this reaction: manifested *affect*, recognizable *imagery*, *spatial configuration* (in the three spheres of representation), and *verbal* expression; these can and could be described more objectively and do invite more exact observation in nonclinical situations. In paragraph (*B*) we shall add the therapist's associations, impressions, and reflections. The resultant interpretation combines the more objective and more subjective elements.

She leans with her back against the sofa, holds the doll over her genital region and drops it on the floor. She picks it up again, holds it over the same region, and drops it again. While repeating this from 10 to 15 times, she begins first to whine, then to cry, finally to yell, "Mommy, mommy, mommy."

(The mother, sure that the game is up, enters the room to take Mary home.)

A. Mary's emotional expression turns a somersault. Sudden hilarity and blushing aggressiveness immediately enter into a dramatic curve of quickly increasing excitement. This likewise suddenly reverts to pale inhibition and overt anxiety. Blind screaming contacts the mother and restores the mother adherence.

The discernible content has been: Pushing and throwing down of things, not with her hand but with an extension of her hand; the dropping from the genital region of the same doll which before, as an extension of the hand, had been, as it were, a pushing tool.

After the physical adherence to the mother is made impossible, the child turns in a diffused way to the room at large and to the small toys in it. However, she does not contact the toys bodily; the doll is used as an extension of the pushing hand. This is "autosphere extension" play; only in pushing the train does she approach a theme in the microsphere (train accident); whereupon she withdraws to the periphery of the room to dramatize an autosphere accident: the loss from the lower abdominal region of the doll which had been an extension of the aggressive hand. Her yells then contact the mother in the other room, thus destroying the doctor-and-the-toy fields and restoring the mother adherence.

Corresponding to this aggressive and regressive behavior, her vocal communication changes from coquettish chuckling to excited laughter, to pale silence, to anxious whining, to desperate screaming, "Mommy, mommy, mommy."

B. The doll in Mary's hand is used in such a way as to appear that she does not dare touch or push the objects with her bare hand. One is reminded that in the play group her strange way of touching and lifting things (never with the whole hand) was observed. This and the rigidity in the extremities suggest that Mary is (constitutionally or traumatically) disturbed in the manipulative and locomotor sphere.

The way in which she then seems unable to stop her own dramatization of something dropping from the genital region reminds one of the interpretation given to certain hysterical attacks, in which the patient is supposed to represent both partners in an imagined scene, *viz.*, the victim and the aggressor. Here it would be the robbed and the robber. Literally, the dropping of a doll (baby) from the lower abdominal region might suggest "birth." However, the doll seems to be an object rather than a person at this point. The half-sitting position she assumes when dropping the doll suggests elimination. Birth and elimination have in common the "dropping" of bodily content. While we know nothing about the events of Mary's toilet-training period, it seems that in the nursery the toilet situations were factors in the outbreak of her anxiety. However, the dropped doll up to the disruption had been a tool of aggression (pushing); its consequent position in the lower abdominal region might suggest that she considers a boy's penis an aggressive weapon, its dropping dramatizing the fact that she has no penis. It is probable that on entering the nursery school Mary was given her first opportunity to go to the toilet in the presence of boys and to see boys' genitals.

Interpretation.—The observations made and the impressions associated so far lead to the following mental note: the doll is used (*a*) as a whole child, with emphasis on its feet, (*b*) as a part of the (pushing) hand, (*c*) as something falling from the lower abdominal region.

Of defensive arrangements the following were recognizable: at the beginning and at the end of the hour self-protection by means of regressive mother adherence and denial of interest in toys and the worker; during the pushing episode, use of an extension (protection? overcompensation?). The defense arrangement breaks down as Mary is overcome by the impulse to push and by some phantasy of the loss of the extension. We may therefore say: Mary seems to be full of mischief (so far expressed as aggressive pushing), but is afraid of her impulses because she may *damage her hand* or *lose something in the genital region* if she does not restrict her sphere of expression and keep close to her mother. She is probably acutely disturbed about the *lack of a penis*, may have been warned of masturbation.

The contact offered neither the opportunity nor the appropriate moment for the therapeutic communication of such an interpretation. However, if the mother had not interrupted (a behavior which throws some light on her part in the child's anxiety situations), the worker would have tried to get in some kind of reassuring verbal contact with the child.

Amplification.

Led outside Mary calms down quickly—so quickly, in fact, that her mother dares to leave her in the waiting room long enough to tell me that Mary had been born with a sixth finger which had been removed when she was approximately a half year old. Just prior to the outbreak in the play group Mary had frequently asked about the scar on her hand and had received the answer that it was "just a mosquito bite." The mother admits, however, that the child in somewhat younger years could easily have been present when her operation was discussed. Around the time of her anxiety Mary had been equally insistent in her sexual curiosity.

We can thus modify and amplify our interpretation: there is probably an association between the mythical *lost finger* and the imaginary *lost penis;* and, consequently, one of the *scar* on her hand and what children not uncommonly consider a *genital scar*.

Before Mary's second visit her mother gave the further information: Mary's *sexual curiosity* had received a blow when, shortly before the outbreak of anxiety, her father, irritable because of an impending legislative decision, had shown impatience with her during her usual morning visit to him in the bathroom and had shoved her out of the room. She had liked to watch the shaving process and had also on recent occasions (to his annoyance) asked about his genitals. It must be taken into account here that a strict adherence to a certain routine situation in which she could do, say, and ask the same thing over and over again always had been a necessary condition for Mary's inner security.

As to the child's physical condition at these particular times, it appears that *bad dreams* with violent kicking in sleep (which mother tries to check by holding her tight and awakening her), and foul breath on awakening had been attributed by one physician to a bad condition of the tonsils. Another physician, however, had denied this. The mother and the first physician had engaged in a heated discussion (before Mary) as to whether she needed an immediate *operation.*

Before we evaluate all these factors (which add the association "operation" to that of "scar" and explain both an increased adherence to the mother during the father's irritable absent-mindedness and an increased fear of doctor possibilities), we shall report Mary's second visit.

Play Satiation.—The antithesis of play disruption is a phenomenon which we shall call "play satiation." If play succeeds, *i.e.*, if it is not disrupted from within or interrupted from without, it has an effect on the child comparable to a few hours of good, long-needed sleep—everything looks different and the child is ready to take new chances. It is this autotherapeutic function of play which we are restoring in many cases by creating for a child regular and undisturbed periods of play, no matter how we rationalize what is happening during such a "cure." In contrast to the little girl's play disruption we sometimes see satiation in the microsphere lead directly into a game in the macrosphere in which the rearrangement achieved in small dimensions is tried out on big objects and people (and this often too courageously for the child's own anxiety or too "naughtily" for the environment). Many a play cure, spontaneous or planned, is wrecked because the environment did not understand or was not warned of such an experimental expansion of the play sphere. Let us see Mary's version of it.

Mary—Worker—Mother.

Mary again smiles bashfully at me, again turns her head away, holding to her mother's hand and insisting that the mother come with her into the room. Once in the room, however, she lets her mother's hand go and, forgetting about the mother's and the worker's presence, she begins to play peacefully and with concentration.

We do not know why the second contact begins peacefully. It often happens that once excessively fearful doctor expectations are disproved (they are, of course, more easily disproved in less neurotic children), the problems which had been previously presented in all their horrors appear, as will be seen presently, in the form of playful restitutions.

Building a House with Blocks.

Mary goes to the corner where the blocks are on the floor. She selects two blocks and arranges them in such a way that she can stand on them each time she comes to the corner to pick up the other blocks. She carries blocks to the middle of the room and builds a small house for a toy cow. For about 15 min. she is completely absorbed in the task of arranging the house so that it is strictly rectangular and at the same times fits tightly about the cow. She then adds five blocks to one long side of the house and experiments with a sixth block until the position marked *X* satisfied her (see Fig. 1). Then with a radiant smile and a mischievous twinkle in her eyes she gets up.

A. Though the mother is present, Mary does not seem moved by impulses of adherence. She builds freely in the middle of the room, moving to the corner and back without hesitation.

As in the first contact, play begins with an autosphere extension, *viz.*, creating a base for the feet, and then concentrates on the microsphere.

The emotional note is peaceful concentration on small-scale play with a certain maternal quality of care and order. There is no climax of excitement, and the play ends on a note of satiation.

Her play has as content the building of a close-fitting stable for a toy cow and the adorning of the stable building with six wings (five plus one).

B. The mother has remained in the room. Mary has concentrated quickly and so deeply on her play that it seems better to let her finish it.

Mary, with all her rigidity, balances well standing on the two blocks and bending down. The fact that she has to create a foot extension (protection? overcompensation?) for herself before picking up blocks reminds us of the fact that during the previous contact she had to add an extension (the doll) to another extremity, her hand, before she pushed the objects in the room. We now associate such extensions with the ideas of "scar" and "operation."

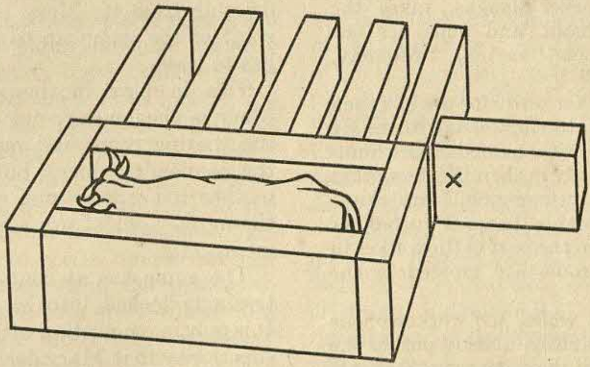

FIG. 1.—Block construction by Mary. (*Genet. Psychol. Monogr.*, 1940, **22**, *p.* 604.)

The house is built with a special expression of maternal "care." The five wings, to which (after some doubt as to where to put it) a sixth is added, again remind one of the amputation of her sixth finger.

But this time, although again beginning with the representation of the extension of an extremity, Mary's play does not lead into an aggressive outbreak (and the subsequent representation of a catastrophe). It finds satiation in the building of a female protective configuration.* There is a pervading femininity about today's behavior which serves to underscore in retrospect and by contrast the danger dramatized during the first contact, *viz.*, the loss from the genital region of an object for aggressive pushing. The combination of a handlike configuration with a female-protective one is accompanied by play concentration and play satiation and concerns positive ideas of restoration and safety—and this concerning the same organ systems (hand, genital region) which in play disruption appeared endangered.

C. Interpretation: The blocks serve Mary: (1) as additions to her feet (extension? protection?); (2) for the building of a house (female-protective configuration) around an animal: safe body content; (3) for the addition of extensions to the building: six fingers to a hand.

Maternal herself and master of the microsphere, Mary restores her body's inviolability by representing as restituted the losses alluded to during the first contact: her feet are extended (protected?); the content of her female body (tonsils? penis? baby?) is well protected; the sixth finger is returned to the hand. The play ends on a note of satiety.

The configurations of Mary's house seemed to us to be a condensed expression of (*a*) her concern over certain parts of her body, (*b*) the feminine protective mode governing her psychosexual stage. She thus not only employs the house body metaphor which Freud found in dreams (8); which poets use when they please ("this mortal house," as Shakespeare puts it); and which primitives seem to have in mind in certain rituals (6); she also expresses in the architecture of her playhouse certain emphases and corrections of her subjective body build. In a longitudinal study of children now older than Mary we are finding that this clinical observation admits of fruitful generalizations.*

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* This is an example of mode play. See footnote, p. 414.

Mary—Worker.

> Suddenly Mary looks teasingly at the worker, laughs, takes the mother's hand, and pulls her out of the room, saying, "Mommy, come out."
>
> The worker waits for a while then looks out into the waiting room. He is greeted with a loud and triumphant "Thtay in there!" The worker withdraws, whereupon Mary closes the door with a bang. Two further attempts on the part of the worker to leave his room are greeted in the same way.
>
> (After a while, the worker opens the door slightly, quickly pushes the toy cow into the other room, makes it squeak, and withdraws it again. Mary is beside herself with pleasure and insists that the game be repeated again and again until, finally, it is time for her to go home.
>
> When she leaves she looks at the worker directly, shakes hands in a relaxed, affectionate way, and promises to "come back.")

A. After being apparently satisfied with peaceful building, Mary suddenly and teasingly turns to me to initiate a game. During the game it is noticeable that, in spite of her aggressive hilarity, she does not tend (as she did during the first contact) toward overdoing aggressiveness and then withdrawing from it; Mary is in the real spirit of the game up to the time she has to leave.

This is play in the macrosphere. Mary is the master, not only of both the waiting room and my office (and the connecting door), but also of her mother and especially of me. She takes the mother out of my space and locks me into it.

The game has as content: a man is teasingly locked into his room alone. It is only in connection with this playful superiority that Mary decides to speak. "Thtay in there" are the first words she has ever addressed to me. They are said clearly and in a loud voice.

B. Mary's provocative behavior came very suddenly and with determination, as if something in her had waited for the moment when she would be free enough to initiate this game. What does it mean? The day before I had asked the mother to leave the room in the middle of the hour. Has Mary anticipated the repetition of this, and has she arranged a triumphant exit with the mother in place of my sending the mother out without Mary? The situation does not seem covered by this interpretation.

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* Most of the play acts observed and interpreted by clinicians are common to all children. Nevertheless, clinical investigation remains within its legitimate sphere when treating these acts as unique and trying to understand their meaning within the psychologic of an individual's system of meanings. Under what conditions, then, the same acts—here produced by Mary—can be said to have a common meaning in all cases, or a special one in some, is best investigated in longitudinal studies; here the normative relevance and the common as well as the unique meaning of typical configurations can be studied with equal care.

Adapting a previous exploration with college students (2) to the realities of a Guidance Study (see Dr. Jean Walker MacFarlane's chapter in this volume, Chap. XVIII), the writer for the last three years has confronted nearly 200 children within a few days of their tenth, eleventh, twelfth, and thirteenth birthdays with a square table, blocks, and a selection of ordinary toys. They were asked to arrange on the table an exciting scene of an imaginary moving picture. The themes and configurations produced are now being analyzed in regard both to unique elements (and their relation to unique life data) and to elements common to ages, stages, and types. It is already generally apparent that differences in house configurations promise to present reliable relations to psychosexual, maturational, and health status. Also, the relative dominance of organ modes during periods of rapid maturation is receiving quantitative substantiation.

The observation of an individual's ideational and affective play behavior and of his utilization of the available play space promises to reveal (*a*) what part of his life subjectively presents a potential "heel of Achilles," (*b*) the relation of this part to his subjective life space determined as it is by his *psychosexual* status and by his particular *creative* and *defensive* ways of synthesizing past and anticipating future.

The words which Mary uses when initiating the game somehow resemble the words which the mother told me the father had used when locking the child out of the bathroom during his days of irritation. "Stay out of here," had been the father's angry words. "Thtay in there" is probably linked with it, although in addition to the transference to me a double reversal has taken place: from the passive to active (it is she who gives orders) and in regard to the vector (she "encloses" instead of being excluded). This is a lot of suspected transformation, but it is systematic and psychologic. One remembers now that, from the moment Mary came into my room at the beginning of the first contact, she showed a somewhat coquettish and bashful interest in me. Since it can be expected that she would transfer to me (the man with toys) a conflict which disturbed her usually playful relationship to her father, it seems possible that in this game she is repeating with active mastery ("You thtay in there") the situation of exclusion of which she has been a passive victim at home ("Stay out of here"). Mary is transferring to me the role of the bad father (father transference) in a rearrangement (reversal of active into passive) of the situation which created the conflict between them.* (This possibility came to me only after I had reacted to her play provocation, which, of course, I was prepared to do as soon as she would have chosen the moment and the theme. By my play acts I unconsciously took the role of the "good father" in a specific way.)

C. Interpretation: peaceful and playful identification with her mother; protection and restitution of her body in play; the teasingly revengeful restitution of the play relationship to her father in transference. The child, as it stands at the end of the second contact, has indicated that she wants to be sure of her mother as a haven of protection, of her father as an interesting masculine playmate, and of her body as an inviolable whole in spite of the (at the time intrusive) impulses it expresses and the bodily dangers (operation) experienced and anticipated.

Etiological Speculations.—The scant material represented here may weigh little on a quantitative scale; on that of clinical judgment it is weighty and remains so in the evaluation of what follows, for it contains the first and only direct evidence of the expectations and readinesses brought by the patient to a situation new to him and familiar to us. Therefore, we take stock of the way in which the first play cycle reflects changes in the patient's life space.

In considering these changes we remember that anxiety is for the personality what pain is for the body: a sign that coherence and integration are endangered by what is happening to one part or function. Since the child, in the changing worlds of his growth, has the continuous task of reestablishing coherence, integration, and mastery while threatened with physical perils and psychological frustrations, he is apt to experience moments of anxiety which must be considered normal.

No form of temporary fear or habit is the origin of a neurosis or is dangerous to the child who is not already neurotic, and personality disturbances

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* See Freud's classical description of these mechanisms as seen in the play of a little boy (9).

only in rare cases appear to have been created by any single factor in body or mind, in heredity, constitution, or environment. Human beings, and especially children, are seen to defend their psychic integrity most successfully in the face of one or more great handicaps. Only where several of these factors unite, are emotional crises created. The most dangerous combination is the *coincidence* in time of events with *affinity of subjective meaning* in the following life segments: (*a*) changes in the body brought about by growth, maturation, or some other disbalancing factor, such as sickness, resulting in new or stronger impulses or fears; (*b*) changes in the constellation or emotional temperature in the environment (*i.e.*, birth, death, sickness, moving, trips, visitors, change of nurses; estrangement between parents; financial worries; religious scruples); (*c*) changes in the person's conception of his psychological status in the world, *i.e.*, a tightening of conscience (guilt feelings) or a change in the conception of causality (inferiority feelings, projections, etc.).

It has been pointed out that nothing appears to be accidental to the anxious child. It is also important to understand that the child's conscience (later on an important part of his unconscious) does not preserve what the parents actually said or meant to say, but what the child, with the selective perception of his particular stage and state of mind, understood them to say.

Physiological Changes.—Special physiological condition: Mary has not been sleeping well of late. She has severe panics (or tantrums) in her sleep, during which she yells, "No, no, no!" Whatever it may be that she is dreaming about, she awakens with a foul breath and there is a suspicion that the state of her throat causes irritation and congestion even if there is no indication for a tonsillectomy. She has heard of the possibility of an operation which she seems to have associated with the loss of her finger.

Environmental Changes.—The sudden addition to her sphere of experience of the play group puts Mary for the first time in her life in the hands of an adult other than a near relative and into a play situation with boys. Both her maturational state and the idea of an operation as associated with the loss of the finger must give the observation of sexual differences (in children) at this moment, even if it has been observed before, a sudden specific pathogenic importance.

At home it seems to be the father's irritability which the child, not knowing the cause, must have misunderstood and connected with the place where it was first experienced (or because of obvious associations most intensely experienced); *viz.*, the bathroom. Thus this experience, too, has been incorporated into the fields of mutually specific factors.

Psychosexual Changes.—In every developmental stage there is a period (we suspect it is the early part of it) when any acute lack or loss of psychosomatic or social support is apt to frighten a child into temporary regression. Such neurotic episodes are characterized by increased anxiety, an apprehensive subjectification of perception, and a stiffening of defensiveness. What it is that makes such episodes permanent nuclei of a chronic neurosis we hope to learn through the study in normal or only temporarily disturbed children of those periods of lowered physiological resistance, those types of faulty environmental support, and those strenuous mechanisms of adjustment which, if occurring together, represent a combination producing traumatic strain. At the moment we are forced to reconstruct such early occurrences from clinical material alone, most of it (in Freud's pioneer experience, all of it) observed in adult patients. Insofar as we are guided by our clinical experience with children we must remember that most of the data we are habitually focusing on have never been described and conceptualized in nonclinical situations.* Thus as Freud has pointed out we are forced to mythologize urges, forces, stages, and mechanisms. But, indeed, to mythologize in ever more probable directions is often the only way to keep on the tracks of vital human problems.

As diagrammatically developed in a previous article (1), the orificial organ modes *incorporation*, *elimination*, *retention*, *intrusion*, and *inclusion* and the body apertures which are their "models" par excellence—*viz.*, mouth, sphincters, and genitals—are combined to normal mutual emphasis in successive stages, namely, the stages described by Freud as pregenital. In each of these stages there is an interrelation between the sensitization and training experience of a vital orifice and the growing periphery of mastery (*a*) oral-(respiratory)-sensory tactual, (*b*) anal-(urethral)-muscular, (*c*) genital-(urethral)-motor.

Surveying the field of zone experience and mode manifestation, one finds that what Freud has described as pregenitality is the development (by way of successive narcissistic organ cathexes) of impulses and behavioral modes the final integration of which implies all the possible relationships of a body and an object and thus the basic spatial modalities of experience. Led (or confused) by zone experience as well as growing capacity children experiment more or less playfully in space with all the possible relationships of one object to another one and of the body as a whole to space. To modes which in their bodily, spatial, or social expression are curtailed by inhibiting experiences the organism offers a limited range of safe displacements in habits and minor symptoms; reality allows for certain systems of subjectified perception and compulsive preoccupation; society permits a number of odd social habits and traits. To the child especially the world of play affords opportunity to experiment with organ modes in extra-bodily arrangements which are physiologically safe, socially permissible, physically workable, and psychologically satisfying.

We say, then, that Mary's play disruption reflects the "intrusive" or locomotor-phallic stage, while her play satiation is characterized by a female-protective attitude. The intrusive stage is governed by the urge to expand one's locomotor sphere and to force one's way into any object of interest and passion. Such an urge, when dominant, dictates the main sensual (libidinal) experiences (locomotion, intrusion, masturbation), which during this time are also the main methods of releasing surplus tension from whatever source. It leads to physical and social experiments and thus collides or coincides with dominant cultural tendencies.

For the personality, the locomotor-phallic stage, like any other, provides a source of experiential wealth and power as well as of danger. The personality is strengthened and enriched by the successfully socialized use of the new impulse which adds impetus to such aspirations as outgoingness and energy, courage in the face of the unknown, etc.; and by reliable reactive virtues—self-restraint, protective attitudes, etc. which permanently counteract the dangers of excesses. However, this may imply excessive and permanent inhibition of intrusive types of action and excessive repression of corresponding thoughts and memories, if, indeed, not masochistic phantasies and provocations.

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* It is for this reason that some reconstructions of the child's normal inner development on the basis of psychiatric ideology rather than of developmental observations, and the application of such reconstruction to the philosophy and practice of education, seem premature.

Special educational interferences with the general mode of the intrusive stage (such as Victorian tendencies to place special limitations on many forms of locomotor and curious expansiveness and to react with disciplinary selectivity to sexual curiosity) result in a fixation on the idea of genital intrusion, making the genitals the subject of excessive cathartic acts or that of excessive curiosity and often the consequently excessive repression of both. Such fixation brings with it a prolonged emphasis on the idea and the fear of intruding and on the idea and fear of being intruded upon and, consequently, fears for the inside of the body (as a goal of intrusion) and for extremities and penis as the organs of intrusive aggressiveness. Such a block of fearful expectations becomes, then, a ready factor in the traumatic effect of experiences which seem to fit it.

It must be obvious, then, that this stage offers special problems to the girl. Led by the intersexual experiences of younger organisms, she too has reached a period of stronger intrusive tendencies, often observed as tomboyishness. During this period it seems to happen that the girl becomes painfully conscious of what she considers a lesser anatomical equipment and a certain minus in physical, mental, and cultural prerogatives. Phantasies of having or achieving a penis (with all its prerogatives) seem to occur. In both cases it is hard for the girl to imagine herself the object of intrusive impulses, especially since in the first infantile theories "cruel" and "sexual" are often synonymous. We know that in certain types and under certain cultural conditions such reservations and apprehensions remain dangerously determining for life, while often, in a way much less well known, the locomotor-phallic complex seems easily and, so to speak, noiselessly subordinated to the wish for a baby and all the prerogatives connected with this possibility.*

Mary, as little as she told us so far, has revealed something of the conflict of the girl who is not sure that she wants to be a girl and does not know whether she wants to be a boy—although she has done so with more grace and humor than we could expect from the chronic victims of this conflict.

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* Among the Sioux Indians, Mekeel and the writer found one very old custom of special interest, *viz.*, the play with "bone horses," small bones about 3 or 4 in. long which the boys gather at places where cattle (formerly buffalo) had been killed. According to their shape they are called horses, cows, bulls, and are either fingered continuously in the boys' pockets or are used by them when playing together at games of horse racing and buffalo hunting. The phallic shape of these bones suggests that they are the medium which allows little boys in the phallic stage of psychosexual development to take their minds off masturbatory occupation with their bodies and, while fingering "horses," "buffaloes," "cows," and "bulls," cultivate the sadistic-intrusive phantasies which at that time shall combine with the impulses arising from their rapidly growing mastery of locomotion to establish in them the aspirations (now anachronistic) common to all males of the tribe.

At the same time in the growing girl fearfulness and inhibition were emphasized by locomotor restrictions: a good girl did not overstep a certain narrow radius around tepee or camp, walked with measured movements, later had her thighs tied at night, made only very small steps in dancing, etc. She would learn that brother and sister should not sit with one another or have direct conversation. She was trained to the use of the materials for building shelter, preparing covering, and conserving food.

Her culture at the same time offered these children the best sublimation psychoanalytic reasoning could advise. The little girl old enough to avoid the brother knew that she would use her skill in sewing and embroidery, on which she was to concentrate henceforth, for the fabrication and ornamentation of beautiful things for his future wife—and for cradles and layettes of his children. The brother for his part knew that he would give her the best of all he would win by hunting or stealing. The first and basic avoidance thus became a model of all respect relationship and of helpfulness and generosity among all the "brothers" and "sisters" of the extended kinship (3).—For comparative material see the basic work of Margaret Mead.

We also understand that during her first contact Mary indicated to us that she had associated the intrusive impulses of the stage just outlined with the idea of "danger to the extremities"—an association emphasized by the allusions to her lost finger, an increased self-consciousness concerning the "lost penis," and the imminent danger of an operation.* However, during her second contact she dramatizes the development of a female-protective attitude and a "manic" mastery of the fears of the intrusive stage.

In regard to the necessary attachment to one or both of her parents of these impulses and fears ("Oedipus Complex"), we can only say that the therapist in this case naturally attracted the father transference; there seems to be little doubt as to the importance at this time of the child's father as a partner in teasing games and as an object of sexual curiosity. The child's flight to her mother is by no means free of ambivalence, as further observation probably would quickly reveal.

Cure and Sublimation.—It so happens that after the second contact Mary's "treatment" was interrupted The clinician may regret this; for our presentation of spontaneous play it is an advantage, since our evidence becomes involved indeed, as soon as the therapist begins to interpret and to enlighten. Mary's parents accepted (and partly themselves suggested) the following recommendations. Mary's curiosity in regard to both her scar and her genitals required a truthful attitude. She needed to have other children and especially boys visit her for play at her home. The matter of the tonsils called for the decision of a specialist, which could then be candidly communicated to the child. It did not seem wise to awaken and hold her during her nightmares; perhaps she needed to fight her dreams out, and there would be opportunity to comfort her when she awoke spontaneously. The child needed much locomotor activity; playful instruction in rhythmic movements might help her to overcome some rigidity in her extremities which, whatever the cause, presumably has been increased since she heard for the first time about the amputation of her finger.

> A conversation with the parents a half year after the contacts described in this report did not seem to indicate the immediate necessity for further psychoanalytic observation. A tonsillectomy had proved unnecessary; the nightmares had ceased; Mary was making free and extensive use of the new play companions provided in and near her home. For various circumstantial reasons, she had, however, not visited the original play group again. She had asked for the worker often, wanting to know the color of the train he had taken when leaving town. This was in accord with a revived play relationship with her father. Enlightened about what had transpired during the play contacts, the father had the intuition to make the most of Mary's sudden raptured admiration for shining locomotives. He took her for regular walks to the train yards, where they together watched the mighty engines.

Here, then, we have a rebirth of the engine idea, which during the first contact was expressed in an attack on a toy engine, and a subsequent play disruption. The probable locomotor-phallic "meaning" of the engine now is more than an individual metaphor used to express fear and ambivalence:

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* This overdetermination would seem to make Mary's case "nonstrategic" for the proof or disproof of the classical castration complex. However, there are no pure cases; some may argue that the power of this complex over a clearly nonsexual factor (as the scar on the hand) is impressive enough; others that our material rather points to a general need for bodily inviolacy.

it becomes a social integrator, a symbol of masculine power shared by the father himself and sustained by the whole imagery of the machine culture in which this child is destined to be a woman. Such transformations of metaphors of fear into guiding symbols seem to be a regular feature in any cure, spontaneous or induced.

> When Mary, a while later, paid the worker a short visit, she was entirely at home and asked him in a clear, loud voice about the color of his train. She addressed her mother and the worker alternately and entered his room without anxiety. Her play immediately centered around the cow again, which, with loving words, was given a tight-fitting stable.

The Meaning of Play Therapy

"To play it out" is the most natural autotherapeutic measure childhood affords. Whatever other role play may have in the child's development (and I do not think that these roles are adequately known), the child also uses it to make up for defeats, sufferings, and frustrations, especially those resulting from a technically and culturally limited use of language. This, the cathartic theory of play, is one of the many play theories, all of which agree only in assuming an untimely tension. If not a *catharsis* for excessive (traumatic) stimulating in the past, play is considered the expression of a *surplus energy* for which there is no more "practical" use at the moment; with untimeliness projected into phylogenetic dimensions, play becomes a *recapitulation* of (now useless) phylogenetic leftovers or the *preparatory* expression of what in the future will be useful activity.

In Spencer's classic words, wherever circumstances allow or suggest play, those tendencies are "*simulated*" which are "*unusually ready to act, unusually ready to have their correlative feelings aroused*" (10), (but at the same time are *not any more* or *not as yet practicable* in connection with their real goal).

Our new knowledge of unconscious and subverbal "readinesses" gives the previous theories of play a new and specifically human meaning. In all its slow maturation and long defenselessness, the human child, so we learn, lives through periods of diffuse, culturally and biologically impracticable impulses of a sensual and aggressive nature, which he cannot help attaching to the narrow circle of his very originators, protectors, and educators—his family. The task of maturation, then, is to outgrow in the most constructive manner these premature emotional and instinctual attachments while outgrowing the need for protection. But this is a slow and partly indefinite process; and the human animal not only plays most and longest, it also remains ready to become deadly serious in the most irrational contexts.

Modern play therapy is based on the observation that a child made ambivalent and insecure by a secret hate against or fear of the natural protectors of his play (family, neighborhood) seems able to use the protective sanction of an understanding adult, in professional elaboration the play therapist, to regain some play peace. The most obvious reason is that the child has the toys and the adult for himself; sibling rivalry, parental nagging, and routine interruptions do not disturb the unfolding of his play intentions, whatever they may be.

The peace provided by solitary play or by play in the presence of a sympathetic adult often radiates for some time, often long and intensively enough to meet the radiation of recognition and love from some source in the environment, a necessary factor in all psychological cures. The chances therefore seem better where the mother too has an opportunity to relieve in conversations her ambivalence toward the child and is prepared to respond to his improvement.

If we can establish the language of play with its various cultural and age dialects we may be able to approach the problem why it is that certain children live undamaged through what seem to be neurotic episodes and how early neurotic children may indicate that they have reached a deadlock.

This objective becomes important at a time when there is increasing awareness of both the extent of mental suffering and the impracticability and social deficiency of the alleviating techniques. Their results point to childhood as the possibly more economic time of correction.

The child's choices (except for that of his parents) are still preliminary; the changes we effect only replace changes which would occur with less planning. One has only one childhood. That which was merely suppressed or repressed after having been reasonably developed and experienced, one may hope to liberate through analysis in adulthood. Emotional impoverishment in childhood is incurable, however, in later life. Furthermore, the child's dependence is his natural state. Transference in childhood has a different connotation; it is of shorter duration and less consistent, and what is transferred to the therapist can be retransferred to the parents. The parents, in turn, are more accessible to correction and advice as long as they and the child are young, and small changes in the parents are often gratefully responded to by the child with obvious and far-reaching improvements. Thus, what is delegated to the therapist can be returned to the home before the child's personality development is completed and before his chances have been exhausted of identifying thoroughly with parents who are enlightened and live up to their capacity to love.

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CHAPTER XXV

THE BEHAVIOR OF YOUNG CHILDREN IN FAILURE*

MARY ELIZABETH KEISTER

The Problem

It is evident that a child in his early years is confronted by many situations that are difficult for him, that are not readily resolved, and that he cannot always be successful in meeting. Educators and psychologists believe that it is important for an individual to respond adequately in situations involving failure or great difficulty. In a child's attempts to meet and overcome difficulties as they arise lie his opportunities to learn and to profit by experience. Moreover, if a child's first attempt to solve a problem is unsuccessful, his subsequent reactions present at least a partial picture of his personality and some measure of his emotional adjustment.

Even a casual observation of young children will reveal wide differences in responses: in the face of a difficult situation some children ask for help from an adult or another child, some retreat from the scene of action when they discover they cannot immediately succeed, some cry or become angry, some rationalize. There are others, of course, who make attempts at their own solution, intently and without emotional accompaniments.

In general, mental hygienists and educators have considered it desirable for a child to attack a difficult problem with composure and to try out one possibility after another in an attempt to reach a solution. They have generally considered that he is not meeting the situation effectively or desirably if he retreats from the problem, if he rationalizes, if he leans heavily on an adult for assistance, if he attacks the problem with such emotional accompaniments as crying, sulking, and tantrums. The problem to be investigated, then, becomes one of discovering the existence of one or the other of these patterns in an individual child and of modifying the undesirable pattern if possible.

Mental hygienists have employed the concept of failure in two ways. They have used it in connection with a situation which is ultimately impossible for the individual to overcome because of his own incapacity; under such circumstances it is important for him to realize this fact and adjust himself to the idea of impossibility. In a second sense they have thought of failure as a step in the process of solving a problem, as involved in the individual's working his way out of a difficulty. It is with behavior of the latter type that this study is concerned. Failure, as defined here, is the child's lack of immediate success following an attempt to contend with a situation, the situation being one in which he sees some relation to himself as an instrument of his own success or failure.

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* An experimental attempt to discover and to modify undesirable responses of preschool children to failure. A full report of this study may be found in Ruth Updegraff, Mary Elizabeth Keister, Louise Heiliger, *et al.* Studies in preschool education. I, *Univ. Ia. Stud. Child Welf.*, 1937, **14**, 29–82. Adapted with permission.

The purposes of the present study may be summarized as follows:

1. To devise tests by means of which one may discover what responses a child of preschool age gives when faced with failure.

2. To select a group of children who evidence undesirable modes of reacting to their failures.

3. For this latter group, to institute a program of training or special help to discover whether or not they can be made to develop more desirable types of responses.

Procedures

Following a preliminary survey of the literature concerning children's reactions to failure which indicated the inapplicability of the method of uncontrolled observation for a study of this kind, plans were made for presenting children with failure experiences in experimental situations by using a series of tests. The decision was made to place the child in two failure situations: one requiring the solution of a puzzle, the other challenging his physical strength. In constructing each experiment the following criteria were borne in mind:

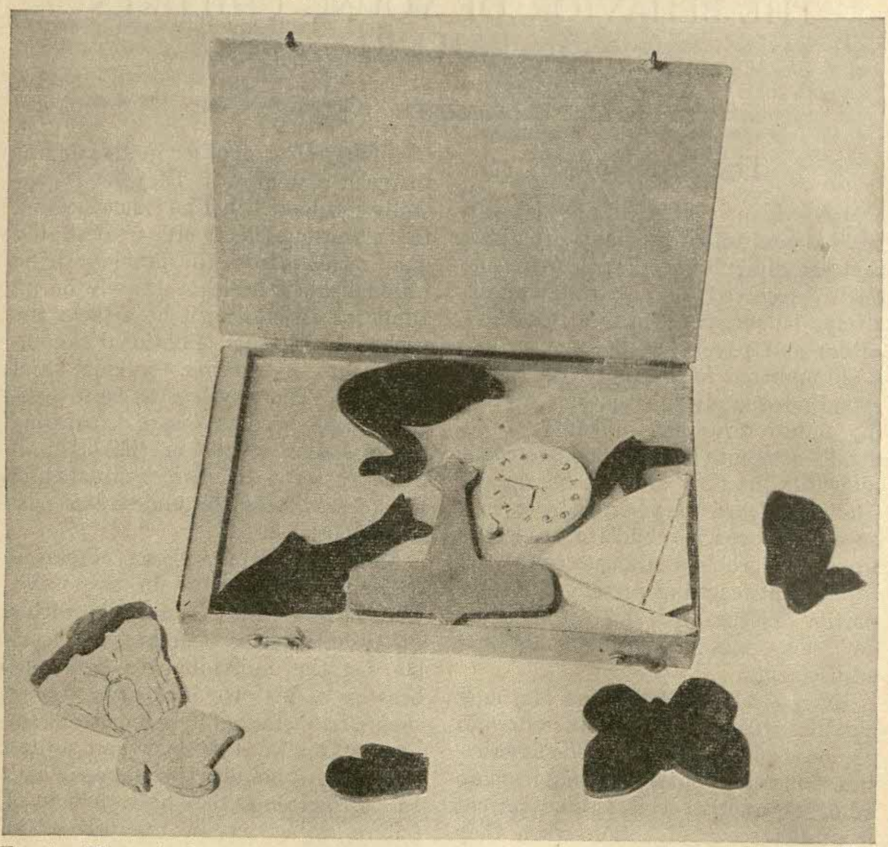

Fig. 1.—The task of putting all the blocks back in the box was so difficult that 84 per cent of the subjects failed in their attempts to do it.

1. It must be possible of accomplishment and yet of such difficulty that the child does not succeed immediately.

2. It must provide a situation which is natural, in the sense that the diffi-

culties are not obviously or forcibly imposed.

3. It must provide a situation in which the average child may see for himself that he has failed and see some relation to himself as an instrument of his success or failure.

4. It must be a task which will interest children of preschool age.

The first experiment, called the "puzzle-box test" (see Figs. 1 and 2), confronted the child with a small, lidded, enameled box approximately 9 in. square. The box being opened, it was found to have a false bottom within ¼ in. of the top. On this lay 10 small colored figures, cut from plywood ¼ in. thick. The figures represented various objects of interest to children, such as a locomotive, a clock, an airplane, a sailboat, etc. The experimenter removed the figures and gave the test instructions which invited the child to put the blocks back in the box so that the lid could go down again. The combination of the size of the box and the shapes of the figures made the problem a difficult one even for an adult, yet it did not present at first glance an appearance of difficulty. The task of putting all the blocks back in the box was a simple one for a child to grasp, and it was one he did not hesitate at first to attempt. It had the additional advantage of providing an almost certain and, to the child, very obvious failure; *i.e.*, he soon realized that he was unable to replace all the blocks in a box where a few minutes before he saw them all lying.

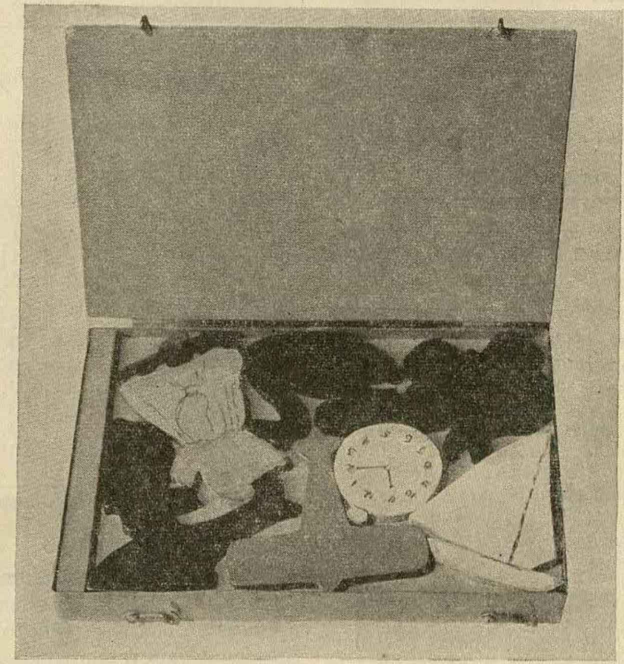

FIG. 2.—Although the problem was a difficult one, it was possible of accomplishment.

The second experiment, called the "weighted-box test," provided for failure by the child in a situation in which his own physical capacity was inadequate to the task. The apparatus consisted of a five-sided, inverted box which was weighted at the ends and through the middle with from 60 to

90 lb. of iron weights. The box was placed in the middle of the room upside down over a group of attractive toys. When the child entered, the box was raised by the examiner and then lowered. Instructions indicated that the toys could be played with if the box could be lifted in order to obtain them. The child was allowed 10 min. in which to work at the problem.

TABLE 1.—MEAN NUMBER OF MINUTES DURING WHICH RESPONSES OCCURRED DURING PUZZLE-BOX TEST ($N = 81$)*

Behavior	Mean	Standard deviation
No overt attempt	2.2	3.2
Attempts to solve alone	11.1	4.2
Asks another to solve	1.2	2.3
Asks help	1.5	2.1
Destructive behavior	0.1	0.5
Rationalizes	1.2	1.8
Interest	10.2	4.7
No emotional manifestations	1.6	2.9
Indifference	0.2	1.4
Smiles	0.2	0.9
Laughs	0.1	0.2
Sulks	0.2	0.6
Cries	0.3	1.2
Whines	0.8	2.0
Yells	0.1	0.4
Motor manifestations of anger	0.04	0.3

* Mean length of experimental period: 13.3 min.

The same scheme of recording behavior was used for both tests. A record was kept of the child's overt behavior during his attempts to solve the problems, the expressive accompaniments of that behavior, together with a running account of his verbalizations during the period. With the aid of a stop watch, the examiner recorded the behavior in ½-min. intervals. The type of behavior observed is indicated in Tables 1 and 2.

The subjects of the study were 82 children (38 girls and 44 boys) who were enrolled in the preschool laboratories of the Iowa Child Welfare Research Station. The range in chronological age was from three years, two months, to five years, eleven months. The mean intelligence quotient was 122.7.

TABLE 2.—MEAN NUMBER OF MINUTES DURING WHICH RESPONSES OCCURRED DURING WEIGHTED-BOX TEST ($N = 74$)*

Behavior	Mean	Standard deviation
No overt attempt	3.4	2.8
Attempts to solve alone	5.7	2.7
Asks another to solve	0.4	3.6
Asks help	1.1	1.9
Rationalizes	1.0	1.5
Interest	5.7	3.2
No emotional manifestations	2.1	2.6
Indifference	0.1	0.9
Smiles	0.3	0.8
Laughs	0.1	0.4
Sulks	0.2	1.0
Cries	0.3	0.9
Whines	0.7	1.7

* Mean length of experimental period: 9.1 min.

Results

Behavior in the Experimental Situations.—The data obtained through application of these tests to a group of preschool children provide answers to the following questions:

1. How do preschool children behave in the face of situations that are difficult for them, in situations in which they are unable to succeed immediately?

2. Are the tests that have been devised truly diagnostic when applied to a group of children in that they differentiate children who respond in a desirable way from those who react in an undesirable and immature manner?

Preliminary analysis evidenced no statistically significant age differences, marked individual differences being outstanding at all ages. Hence the data were not classified into age groups, but all subjects were grouped together for purposes of analysis.

The puzzle-box test, given to 81 subjects, revealed a wide variation in responses. The comparative frequency of types of responses is indicated in Table 1. From the table it will be seen that such behavior as smiles, laughs, cries, whines, yells, destructive behavior, etc., was of relatively infrequent occurrence and was manifested by only a few of the children (as shown by the large standard deviations from the means for those items). On the other hand, attempts to solve the problem alone, with accompaniments of interest for almost the entire duration of the experimental period, were the types of reactions most frequently observed. Such responses as rationalizing, asking help, or asking the examiner to solve the problem were not uncommon, although they occurred with considerable variation from child to child. The amount of spontaneous verbalization during the experimental period was particularly striking. The large majority of the children carried on a running conversation with the examiner while working intently at the task.

The frequency of types of responses to the weighted-box test (given to 74 children) is shown in Table 2. In contrast to the puzzle-box test, the weighted-box test never elicited the responses of destructive behavior, yelling, or motor manifestations of anger. The most common type of reaction was an attempt to solve the problem alone. Manifestations of interest in the task were more frequently found than any other type of expressive behavior. Asking help from the examiner and rationalizing were rather common, although here, too, the variation from child to child was wide. Verbalizing by the child occurred to much the same extent as during the puzzle-box test, although in the case of the weighted-box test the verbalizations came largely when the children were not working on the task.

The diagnostic value of the tests is here judged in terms of how well they differentiate between the responses of the subjects to whom they are administered. It is of particular import to our study that they differentiate between those children giving undesirable and immature responses and those who give satisfactory or desirable responses. Certain kinds of reactions which have generally been considered by mental hygienists and psychologists to be immature or undesirable from the point of view of the child's personality and adjustment were defined rigidly and specifically in terms of the two tests. If a child's behavior on either or both tests fell into two or more of the following classifications he was judged to have given an immature response:

1. Retreat from the task, or giving up almost at once or without exploring many of the possibilities of solution; giving up attempts to solve the puzzle-box test in less than 5 min. or to solve the weighted-box test in less than 2 min.
2. Repeated and numerous requests for help; if the child requests help during more than one-half the total time of the test he is not meeting the situation effectively.
3. Manifestations of destructive behavior with intent to harm the object or persons connected with the difficulty.
4. Rationalizing; making more than two rationalizations in a given 10- or 15-min. experimental period.
5. Evidencing exaggerated emotional responses such as crying, sulking, yelling, etc.

Analysis of the test records on the basis just described showed a total of 15 children, or 18 per cent of all the subjects taking the tests, who might be judged to be giving undesirable responses in the face of failure.

These 15 subjects were grouped together and their responses on the tests were compared with the responses of the remainder of the children who had been given the tests. A comparison of these two groups showed statistically reliable differences on all items of behavior. Thus it became evident that the groups were rather clearly differentiated, that the tests actually were able to show differences in the reactions of a group of children. It would seem that through the use of these two tests it is possible to select a group of children whose responses to situations involving some difficulty are immature and undesirable and that the group so singled out will differ significantly from all the rest of the subjects taking the tests. It must be borne in mind, however, that this applies only so far as *undesirable* behavior is concerned and only where the definition of what constitutes an immature response is as rigid and specific as it was for the purposes of this study.

Experimental Modification of Undesirable Behavior.—In order to discover whether it is possible to modify a child's reaction to his own failure in a difficult situation a program of training was instituted. A group of 12 children whose responses on the initial tests seemed undesirable (as judged by the criteria outlined above) were given training. It was the aim of the training program to raise the responses of the immature group nearer the level of desirability and maturity which characterized the responses of a large proportion of the children taking the tests. The basic philosophy underlying the training program asserted that a child can learn to meet failure in an acceptable and controlled manner if he knows from experience what type of behavior is likely to bring success or satisfaction. Specifically, the training was directed toward teaching the child to persist longer in the face of tasks that were difficult for him, to depend less on an adult for help in solving a problem, to give fewer rationalizations in the face of his failure, and to attack a problem and see it through with some composure.

The method of training consisted of introducing the child to a series of problems which grew progressively more difficult as the program of training proceeded. The tasks were graded in difficulty so that the child experienced success in the earlier ones and gradually worked up to problems which were quite difficult for him. The later tasks were of such difficulty, in fact, that the child found it necessary to persevere and to continue his efforts for some time, in order to attain success. The tasks were designed to be of particular interest to children of preschool age and, further, to enable the children to see their progress and previous successes.

Two training situations were arranged, similar in type but differing in the specific materials used. For the first, three picture-puzzle books were prepared, each puzzle in the series more difficult than the one preceding it (see Figs. 3 and 4). The puzzles were embedded in interesting, colorful, and appropriate storybooks. The pictures were mounted on four-ply wood, varnished, cut into puzzles, and the book was rebound on loose rings. The experimenter read the story to the child and as she reached a part illustrated by one of the pictures she stopped for him to put the puzzle together before continuing the story. After the picture was completed it was covered with cellophane, the "page" was turned, and the story resumed until the next picture. Each of the three books contained from four to six puzzles.

The second problem situation in the training series was a block-building task. A "block boy" was built by the child. This block structure was to be copied from a colored pattern drawn to scale and hung on the wall. It was made of colored blocks which matched the drawing. The blocks were placed upon each other so that the "boy," having attained first feet, then legs, then trunk and arms, and finally a head, stood at last about 3 ft. high—a somewhat precarious figure and frequently an exasperatingly unsteady one. Usually several attempts were necessary in order to complete the task.

After a successful production his builder had the task of devising a hat for him from a wide variety of materials provided.

The trainer or examiner worked individually with the subjects. The training periods varied in length from 8 to 33 min., depending largely upon the difficulty of the tasks and the child's behavior. At no time did the examiner give any actual help in solving a puzzle. If the child asked for help she said, "I won't need to help you. You can do it all by yourself if you keep on trying." Or she suggested, "Try that piece some more different ways. You'll soon find out, by yourself, how it goes." Or, "Keep trying it in different places. You'll get it in the right place in a minute if you keep on trying."

When a subject had achieved success on the simpler puzzles, he was introduced to the more difficult ones. Then if he requested help the examiner said, "You did those puzzles in the train story all by yourself yesterday. You will know how to do these all by yourself, too, because they are made the same way." Or she reminded the child as he sat down to work, "Remember how you did the puzzles in the story about the horse? You kept right on trying until you got it right."

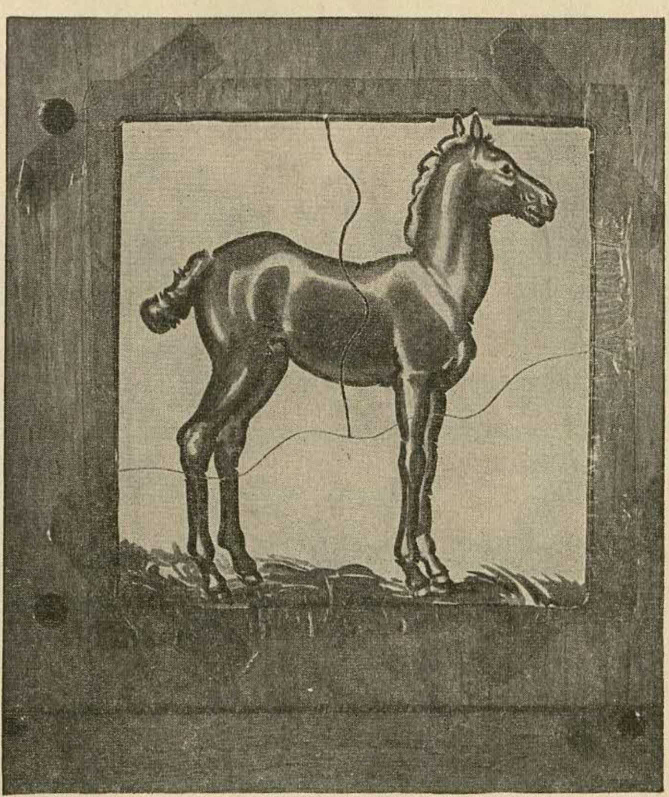

FIG. 3.—The training program began with simple puzzles on which the child was certain to be able to succeed.

The trainer attempted to attach a certain amount of satisfaction for the child to making a sustained effort to solve the problem without numerous requests for help. In such instances she praised the child, saying, "Good for you! You kept right on trying until you found the way to do it, didn't you?" Or, "That was fine! You are learning to try hard and not have anyone help you. You did that one all by yourself."

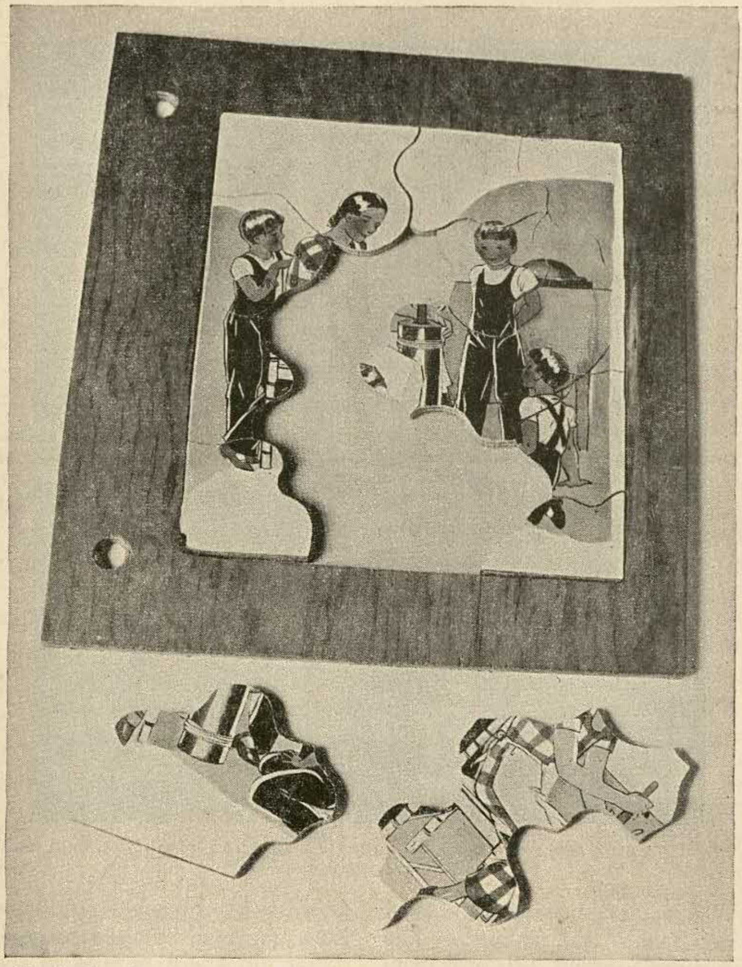

Fig. 4.—Gradually the program led the child toward problems which required of him more and more persistence in order to solve them.

Other suggestions from the examiner which were given to every child at some time (and to some children many times) during the training process were: "Keep on trying some more. See if you can do it all by yourself."

"You need to try some more before you say 'I can't' because you *can* do it if you try a while longer."

"You see, I didn't need to help you. You could do it all by yourself after you tried it more different ways."

"You haven't tried that piece very many ways yet. You keep trying and pretty soon you'll find where it goes."

"You worked hard on this book just as you did on those others. And you got the others done nicely because you *kept on trying*."

Usually as the child left the experimental room, the examiner said to him, "You did a good job of making the puzzles in the book today. You were able to do them nicely because you worked hard on them. You kept on trying until you had them finished. And that's a good way to work."

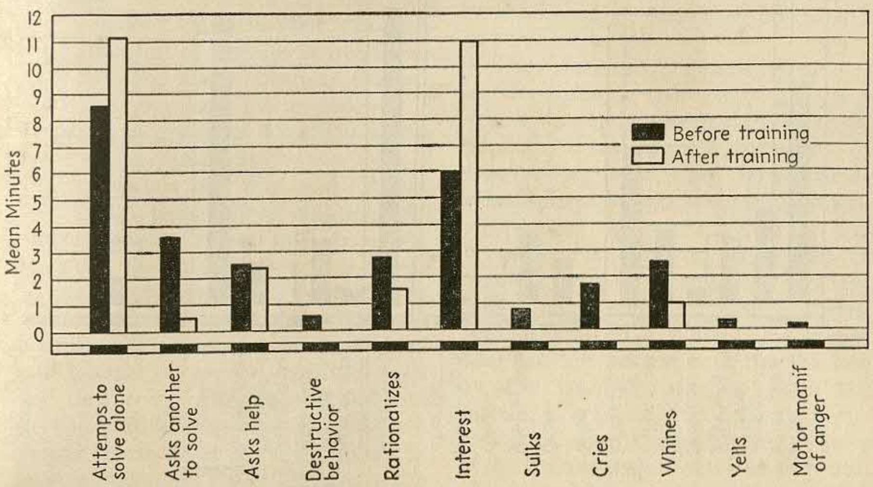

FIG. 5.—Responses of trained group on puzzle-box test before and after training.

When the subjects had difficulty with the building of the block boy, the examiner would encourage them, "Now you have a chance to start over and build it straighter and steadier than before." Or, "This will be a good chance to make it over again better than ever." Frequently she said, "Oh, it's too bad it fell again, but you can use this chance to start over and build it back again better than ever."

Results of the Training Program. *Changes in Behavior during the Process of Training.*—As the program of training proceeded it was noted that the children being trained asked less help of the examiner even though the problems were growing more difficult. They spent longer and longer times at the tasks without giving up. They showed greater interest in doing the tasks for themselves without help from anyone. This not only was shown in a quantitative analysis of actual time spent at the tasks, time spent asking help, etc., but also was revealed rather clearly in a qualitative study of the subjects' verbalizations. The children began to say, "I'll try and try till I find how it goes." "I'll try all of 'em. I'll try all the ways. Then I'll know." "Oh, look, I finded the way! I tried and finded the way." The day one child returned with the examiner to do the final puzzles he said as he sat down at the table, "I'll try all of 'em till I know how they go. I'll work real hard. I'll try each way. I'll try every way."

One child who had to rebuild the block boy twice said, "I'm sure havin' a hard time, but I'm makin' him better. I think it will be better this time." Another child said, "If he fell then I would have to make him up again and he's hard to do." When the construction did fall he said, "I'm going to make you gooder—nice and even this time."

Transfer of Training to an Experimental Situation.—In order really to judge the effectiveness of the training experience (*i.e.*, the extent to which the children's reactions to failure were actually modified or improved), it was essential that the children be placed again in an experimental situation of some difficulty. For this "retest" a variation of the puzzle-box test was used. The box was repainted and new figures were made for it. All the 12 children who had been given training were tested again, using this new form of the puzzle-box test. The carry-over of the training to a new situation showed strikingly in the retest results. Figure 5 shows the responses of this group to the test when it was first administered to them and their responses to the test at the end of the period of training. Differences in the means for the items "attempts to solve alone," "interest," and "cries" are statistically significant. The differences were in favor of the responses given on the retests and indicate that a measurable improvement was effected in the responses of the group by the training program. The exaggerated emotional reactions of sulking and crying entirely dropped out of the responses of this group. It may also be seen that the children excused their failures less often and "asked another to solve" much less frequently.

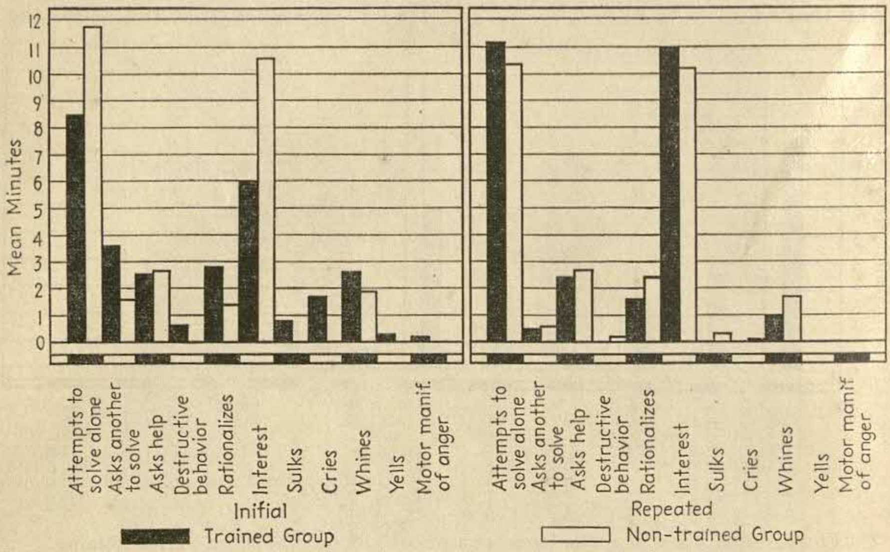

FIG. 6.—Responses of trained and nontrained subjects on initial and repeated tests. Interval between tests averaged four and one-half months.

Improvement in the child's general attitude showed up in an analysis of the verbalizations on the retest. Attitudes changed from ones of "I can't. I can't. You have to show me," accompanied by crying, yelling, or sulking, to "See, I'm almost gettin' this right. Pretty soon I'm gonna know how it goes." One child on the initial test had tried for only 3 min., spent the rest of the time saying, "I can't. I don't know how to do it. I can't make spaces. You do it, 'cause I can't. You hafta do it." On the retest he made consistent attempts for 12 min. and actually succeeded at the task in 13 min. He said, "Say, this is sure a hard game, but I can do it. I'll find out where this b'longs. Say, I'm gonna try and try and get this right. Oh, lookie, I'm almost gettin' space enough. Maybe I can do it all myself."

The Control Group: Changes in Behavior of Nontrained Subjects.—The question may rightly be raised as to whether the changes noted above might not be a function of preschool attendance, or perhaps be merely the result of the subject's having grown older (and presumably more mature) in the interval between tests. Was the improvement a direct result of the training program or was it a function of a number of undetermined, perhaps indeterminate, factors? To obtain answers to these questions or to substantiate the contention that the improvement demonstrated was actually the result of training it was necessary to retest also a group of children who had not had the experience of training. A group of 12 children was selected for retest and the new form of the puzzle-box test was used. During the initial tests, these children had shown some undesirable behavior, although their reactions had not been so exaggerated as those of the 12 who were selected for training. Figure 6 compares the responses of the trained and nontrained groups on initial tests and on retests. Although on the first tests the difference between the two groups was in favor of the group not to be given training, the differences in the responses of the two groups after one group had been trained were no longer significant. As a matter of fact, it will be seen from Fig. 6 that, whereas such behavior as crying, sulking, and destructive behavior has entirely dropped out of the responses of the trained group, a small proportion of the subjects in the other group have added these types of behavior to their responses. Such results afford evidence of how well the training program succeeded in bringing the responses of the immature or undesirable group toward the level of the responses for the rest of the group. The results furnish evidence, further, that increase in age or length of attendance in the nursery school are probably not responsible for bringing about any large improvement in an individual child's reaction to failure. The changes that were found for the trained group, then, may be largely accounted for on the basis of the special training the subjects had received.

Discussion

For the specific conditions of the present study, it has been rather clearly demonstrated that it is possible to modify or improve a child's response in the face of his own failure. Improvement may be observed not only in overt behavior responses but also in general attitudes.

The results cited must be interpreted in the light of the conditions under which the study was made. The entire program of training was carried out by the writer, who also gave all the retests. In order to draw any very wide conclusions as to the effect of this procedure of training, it would be necessary to determine whether the same improvement in the subjects' responses would be noted had someone who had not worked with the children on the training program done the retests. It is possible that the subjects' responses were affected by the presence of the trainer, for the children were well aware of what behavior she expected of them in a difficult situation.

Probably the most important contribution of the study lies in the fact that this program of training when applied to a group of children had a marked effect upon their later behavior in difficult situations. And the influence of the training was entirely in the direction of *improving* their responses.

Of particular interest to teachers and mental hygienists may be the fact that the program of training used in the study was not arduous or time-consuming. It took one examiner only 6 weeks to give this special training to a group of 12 children. The implications of such a program for the mental health and personality adjustment of a child are so wide as to suggest the value of its continued application in the field of education. Refinements of the techniques may be worked out by further research, but even as the procedure stands it may profitably be applied in the situations that arise from day to day in which children are called upon to meet failure.

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CHAPTER XXVI

FRUSTRATION AND REGRESSION*

ROGER G. BARKER, TAMARA DEMBO, AND KURT LEWIN

Introduction

In psychology the term "regression" refers to a primitivization of behavior, a "going back" to a less mature way of behaving which the individual has "outgrown." A temporary regression frequently occurs in intense emotional situations with normal adults and children, particularly if these situations are unpleasant. Extreme joy, too, may lead to certain primitive actions. Fatigue, oversatiation, and sickness often cause transient regression. A more or less permanent type of regression can be observed in certain cases of senility, in a great variety of neuroses, and in functional and organic psychoses. Regression, therefore, has to be considered a common phenomenon which is related to many situations and problems and which concerns the total behavior of the person rather fundamentally.

The relation between regression and development is of special interest and significance. Knowledge of psychological development has increased considerably during the last decade. An impressive variety of developmental processes has been revealed. However, our knowledge of the factors determining development is extremely meager. Regression can be viewed as a negative development. The experimental study of regression seems to be technically somewhat easier than that of development as it is ordinarily conceived. Therefore, the indirect way of studying the dynamics of development by studying regression may prove to be fruitful for the whole problem of development.

Our first step was to describe in conceptual terms the behavior and state of the person corresponding to different developmental levels. It was our hope that, since regression involves a reversal of the direction of these changes, such conceptualization might provide some basis for hypotheses as to the conditions which should lead to regression.

Developmental Stages. *Degree of Differentiation.*—There is much evidence to indicate that during development the degree of differentiation of the person and of his behavior increases greatly. This is shown by the increasing variety in all aspects of the growing child's behavior, and the shift from generalized mass activity in the fetus and neonate (*cf.* Chaps. II and III) to highly specialized actions in the child and adult. The change of the arm and hand, for example, from a highly unitary and inflexible reaching and prehensile organ in the infant to a highly differentiated instrument capable of many complicated and specialized actions in the child and adult is a case in point (*cf.* Chap. IV).

Type of Organization.—The type of organization changes as the child develops. In the fetus and infant, organization of the parts is to a great extent in the nature of simple dependence of one part upon contiguous parts.

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* A more detailed report of this investigation will be found in a monograph by the writers (1). Adapted with permission of University of Iowa Studies in Child Welfare.

Changes in state and function result from the diffuse spreading of influences to neighboring parts (*cf.* Chaps. II and III). With the increasing differentiation of the organism, however, a stratified or hierarchical type of organization becomes increasingly important. In this type of organization there is a series of levels of control. It is exemplified in such diverse fields as motor behavior, language, and play. In each of these the occurrence of increasing numbers of behavior possibilities—*e.g.*, independent movements of digits, new words and parts of speech, new ideas—does not result in more chaotic behavior, as would be expected if the simple diffusion-of-influence type of organization persisted. Activities are extended to longer and longer episodes in which small units of action are guided and organized by larger intentions. The independent fingers become tools under the dominance of higher centers that can enforce upon them many kinds of organized unity, whereas with the undifferentiated hand but one form of unity is possible. The larger vocabulary does not result in more profuse babbling, but in sentences organized to express controlling ideas.

Scope.—The scope of the child's life space increases with age. In the present connection we are particularly interested in the lengthening of time perspective (2). The infant lives in the present, but behavior becomes increasingly controlled by goals and expectations that are temporally more and more remote as development proceeds.

Reality and Phantasy.—During development the perceived environment seems to become less subjectively colored. What is perceived becomes less directly dependent on the changing moods and needs of the individual. In other words, reality and phantasy become more clearly distinguished, yet not completely separated (3, 6). Creative activity seems to depend upon the maintenance of a particular relation between reality and phantasy. The too realistic person who does not have the imagination to "see" possibilities of changing the existing real situation cannot be creative; on the other hand, the dreamer who phantasies with no regard for the exigencies of reality is also unproductive.

There are, of course, many other characteristics of development, but these appear to be rather fundamental, and we assume that any influences that operate to change the child in directions that are opposed to them should lead to primitive behavior, *i.e.*, lead to regression.

Conditions for Regression.—This study reports an attempt to create regression in children by frustration. It can be viewed from two angles. (*a*) It is an attempt to clarify the nature of regression and the conditions leading to it by testing certain theoretical assumptions about regression. (*b*) It can be viewed as a contribution to the study of frustration.

Theoretical considerations suggest that one of the conditions which may lead to regression is a situation in which the person is in a state of blocked tension. From the description of developmental stages it follows that a state of high tension should lead to a regression in at least three respects. (*a*) If the state of tension in some parts is maintained at a high level, the variety of patterns of states of the person which can be realized will be greatly diminished (1, pages 40 and 247). (*b*) If the tension is so great that it spreads beyond the parts immediately involved and extends to the whole organism or to large parts of it, an obliteration of the divisions between weakly differentiated parts will result. In both of these cases a condition of high tension produces a dedifferentiation of the person. This, as we have seen, is a change in a direction opposite to that occurring in development, and it should show itself in a regression of behavior (1, page 241). (*c*) In states of high tension the hierarchical organization is likely to be affected. The direct spreading of tension will be greater when the tension is high than when it is low; hence organization processes of the type of simple diffusion of tension will increase in importance relatively to hierarchical organizing processes. This, too, is a change opposite to developmental changes and should lead to regression (1, pages 41 and 257).

The experiments which we are going to report are not intended primarily to give proof that in a state of high tension the action toward an obstructed goal regresses to a primitive level. They are an attempt to go one step further. If the assumption is correct that a sufficiently high tension leads to regression of the individual, this condition should reveal itself not only in action toward the inaccessible goal, but also in behavior that is not related to this goal. Presenting a frustrating situation, *i.e.*, one in which an individual is prevented from reaching a desired goal, is one way of creating tension.

Procedures

In the investigation we have studied the effects of frustration upon behavior by comparing the behavior of children in a nonfrustrating or free-play situation with their behavior in a frustrating situation. We have used as a major criterion of these effects the productivity or creativity of play behavior. We chose to use constructiveness of play as one of the main indicators of the effects of frustration for the following reasons. (*a*) It was assumed that the constructiveness of play would vary according to the developmental stage of the child. (*b*) It seemed probable that, in a free-play situation, where there is very little outside pressure, behavior would reveal with particular sensitivity the inner state of the child. (*c*) Constructiveness of play appeared to be closely related to many aspects of the child's life space, particularly to reality and phantasy, to scope, and to degree of differentiation.

In addition to the constructiveness of play, emotional expression has been analyzed, also.

Every child was observed on two occasions. First, the child was placed in a standardized playroom and allowed to play without restriction. On a second occasion he was placed in the same room and with the same toys. However. on this second occasion there were also in the room a number of highly attractive, *but inaccessible*, toys. The latter arrangement was provided by replacing a temporary wall of the original room with a wire-net partition through which the subject could easily see the fine toys but through which locomotion was impossible.

The subjects in the experiment were children who attended the preschool laboratories of the Iowa Child Welfare Research Station. The experiment was conducted during the academic year 1935–1936. Data concerning chronological and mental ages and I.Q.'s are given in Table 1. The Kuhlmann-Binet was used with the 10 younger subjects, the Stanford-Binet with the 20 older subjects.

TABLE 1.—CHRONOLOGICAL AND MENTAL AGE DATA FOR SUBJECTS

	Chronological age, months	Mental age, months	I.Q.
10 Younger subjects:			
Range....	25–40	30–44	100–141
Mean.....	32.3	36.9	114.8
20 Older subjects:			
Range....	42–61	49–82	110–157
Mean.....	51.7	64.6	125.5
Total group, mean.....	45.2	55.4	121.9

Free-play Situation.—The arrangement of the experimental room in the free-play situation is shown in Fig. 1. On the floor of the room there were three squares of paper, each 24 by 24 in.

A set of standardized play materials was placed on each square. On one square there were the following things: a little chair on which a Teddy bear and a doll were seated, a cup, a small truck and trailer, a saucer, a teapot without a lid, an ironing board and an iron (but nothing to iron), and a telephone receiver which squeaked when shaken. On another square were placed a box of crayons and two pieces of writing paper 8½ by 11 in. On the third square there were a small wooden motorboat, a sailboat, a celluloid duck and frog, and a fishing pole with a line and a magnet for a hook.

After entering the experimental room with the child, the experimenter approached Square 1, and picking up each toy said, "Look, here are some things to play with. Here is a Teddy bear and a doll. Here is an iron to iron with," etc. In proceding this way, the experimenter named and demonstrated every toy on all three squares. Then he said, "You can play with everything. You can do whatever you like with the toys, and I'll sit down here and do my lesson." The experimenter then sat on the chair at the table.

The child was left to play alone for a 30-min. period. During this time the experimenter, as if occupied with his own work, sat at his table in the corner and took notes on the child's behavior.

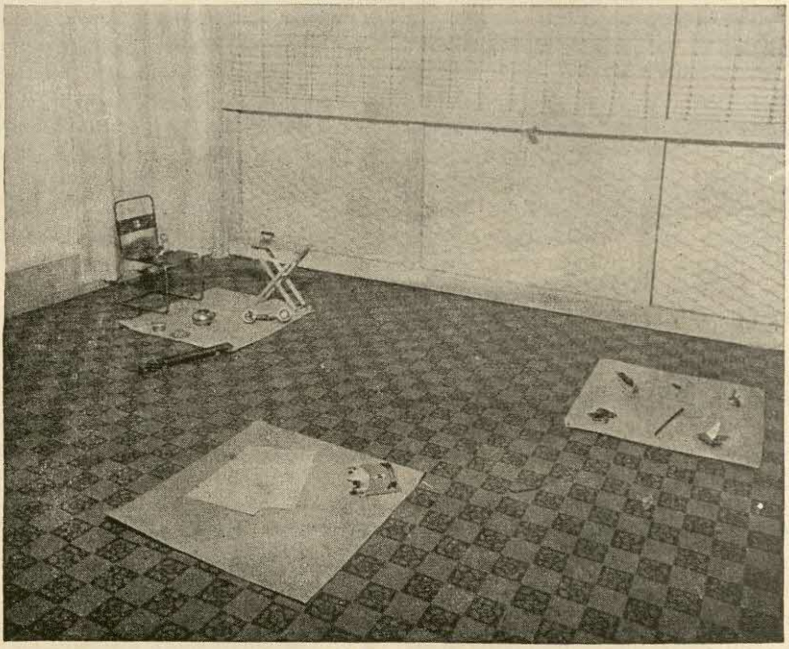

FIG. 1.—Free-play situation. (*From Univ. Ia. Stud. Child Welf.*, 1941, **18**, *No.* 1, *p.* 51.)

Frustration Situation. *Prefrustration Period.*—Three parts of the frustration experiment can be distinguished in the temporal order of their occurrence: (*a*) the prefrustration period, (*b*) the frustration period, and (*c*) the postfrustration period. The arrangement of the room in the prefrustration period is shown in Fig. 2. The partition dividing the room was lifted so that the room was twice the size it had been in the free-play situation.

The squares were in their places, but all toys except the crayons and paper had been incorporated into an elaborate and attractive set of toys in the part of the room that had been behind the partition.

In one corner there was a big doll-house (3 by 3 ft.). It was brightly decorated and large enough to admit the child. Inside there was a bed upon which the doll was lying, a chair in which the Teddy bear sat, a stove with cooking utensils, and a cupboard. The ironing board with the iron on it stood against one wall, and the telephone, this time on its base with a dial and bell, was in a corner. The house had electric lights, curtains, and a carpet.

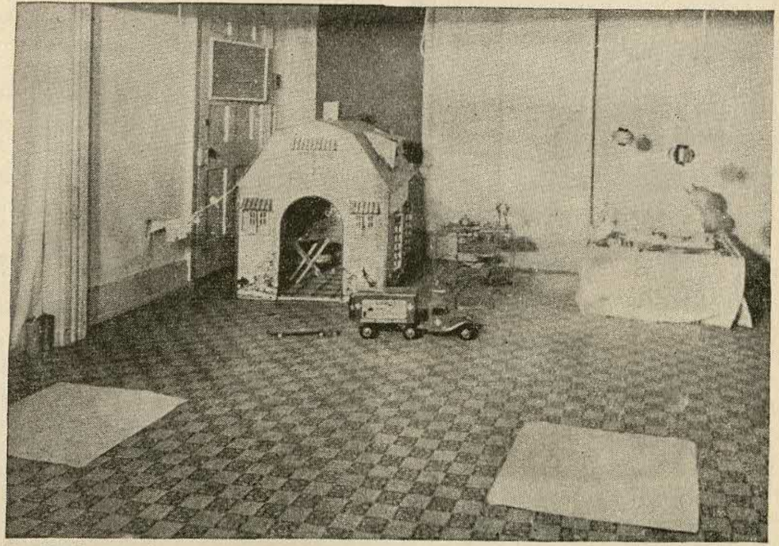

FIG. 2.—Prefrustration situation. (*From Univ. Ia. Stud. Child Welf.*, 1941, **18**, *No.* 1, *p.* 55.)

Outside the house there was a laundry line on which the doll's clothes hung. A rubber rabbit sat near the entrance to the house, and behind it was the small truck and trailer used in the preceding experiment. Near by there was a child's table prepared for a luncheon party. On the table there were cups, saucers, dishes, spoons, forks, knives, a small empty teapot, and a large teapot with water in it.

In the other corner of the new part of the room there was a toy lake (3 by 3 ft.) filled with real water. It contained an island with a lighthouse, a wharf, a ferryboat, small boats, fishes, ducks, and frogs. The lake had sand beaches.

In all cases the children showed great interest in the new toys and at once started to investigate them. Each child was left entirely free to explore and play as he wished. During this time, the experimenter did his "lesson."

If, after several minutes, the child had played with only a limited number of objects, the experimenter approached and demonstrated the other toys, *e.g.*, he dialed the telephone or showed the child how to get the water from the spout of the teapot. In general, the experimenter tried to call the child's attention to every toy he had overlooked. Then he returned to his place and waited until the child had become thoroughly involved in play; this took from 5 to 15 min.

The prefrustration period was designed to develop for the child a highly desirable goal which he could later be prevented from reaching. This was a prerequisite to creating frustration.

The transition from prefrustration to frustration was made in the following way. The experimenter collected in a basket all the play materials which had been used in the free-play experiment and distributed them, as before, on the squares of paper. He then approached the child and said, "And now let's play at the other end," pointing to the "old" part of the room. The child went or was led to the other end and the experimenter lowered the wire partition and fastened it by means of a large padlock. The part of the room containing the new toys was now physically inaccessible but visible through the wire netting.

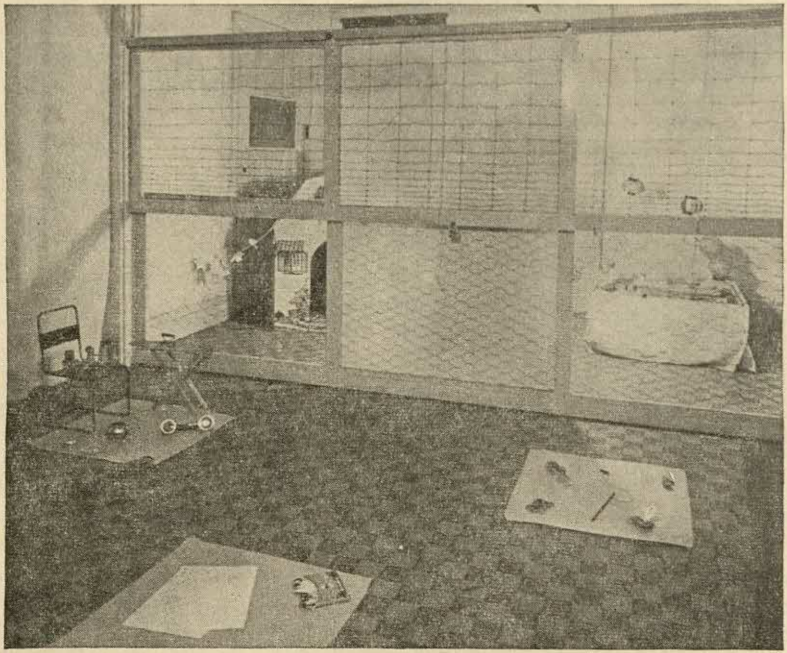

FIG. 3.—Frustration situation. (*From Univ. Ia. Stud. Child Welf.*, 1941, **18**, *No.* 1, *p.* 57.)

Frustration Period.—The arrangement of the room in this part of the experiment is shown in Fig. 3. With the lowering of the partition, the frustration period began. This part of the experiment was conducted exactly as the free-play experiment. The experimenter wrote at his table, leaving the child completely free to play or not as he desired. The child's questions were answered, but the experimenter remained aloof from the situation in as natural a manner as possible.

Thirty minutes after the lowering of the partition, the experimenter suggested that the child leave.

Postfrustration Situation.—After the experimenter had made sure that the child wanted to leave, the partition was lifted. Usually the child was pleasantly surprised and, forgetting his desire to leave, joyfully hurried over to the fine toys. If the child did not return spontaneously, the experimenter suggested his doing so, and a second suggestion was never necessary. The lifting of the partition at the end of the frustration period was not done with an experimental purpose, but to satisfy the desire of the child to play with the toys and to obviate any undesirable aftereffects. The child was allowed to play with the house, lake, etc., until he was ready to leave.

Results

The raw data consisted of two synchronized running accounts of the course of events, one made by an observer behind a one-way vision screen, the other by the experimenter. These separate records were combined into a single, more complete, account. This was desirable since it allowed the observers to concentrate their attention upon the different aspects of the behavior that they could best observe. An observer behind a screen necessarily misses much: the verbalizations of the child are often incomprehensible, and facial expressions and gestures lose much of their significance. However, he can observe the larger aspects of the behavior adequately. On the other hand, the very wealth of detail which the experimenter within the room is able to observe causes him sometimes to miss the sequence of activities and their larger significance.

Both the free-play situation and the frustration situation produced two general kinds of behavior: (*a*) occupation with accessible goals, and (*b*) activities in the direction of inaccessible goals. We shall call the first "free activities" and the second "barrier and escape behavior." Playing with the available toys and turning on the light are examples of free activities; trying to leave the experimental situation or attempting to reach the inaccessible toys behind the barrier are examples of barriers and escape behavior. Within each of these categories it is useful to differentiate further.

Types of Behavior. *Free Activities.*—The free activity includes play with the accessible toys and diversions with nontoy objects.

Diversions, *i.e.*, occupation with nontoy objects, include the following: (*a*) *Activities with the experimenter* (other than those which are social attempts to reach the inaccessible toys or to escape from the experimental situation). This behavior takes the form of conversation with the experimenter, helping him with his "lessons," and playing with him. It has been mentioned before that every effort was made not to encourage these contacts. (*b*) *Activities at the window:* climbing upon the sill and looking out. (*c*) *"Island" behavior:* Despite our continual vigilance in excluding any but standardized objects from the room, the children were forever finding additional material—*e.g.*, a nail or a piece of string—or selecting for special attention some indifferent object in the room, as the light switch or a crack in the floor. Such objects not infrequently appeared to have the significance of a foreign object to the child, *i.e.*, one not naturally connected with the rest of the situation, and as such to provide a refuge or an island of escape within the situation. (*d*) *Looking and wandering about.* (*e*) *Disturbances:* reactions to outside noises, lights failing, etc.

Barrier and Escape Behavior.—Both attempts to gain access to the toys behind the barrier and attempts to leave the experimental situation may entail (*a*) actual physical approaches to the inaccessible regions, such as trying to lift or climb over the barrier or kicking the door; (*b*) social attempts by means of requests, pleadings, coaxing, threats, etc., to get the experimenter to raise the barrier or open the door; or (*c*) passive directed actions such as looking at or talking about the inaccessible toys or the outside regions.

Overlapping Activities.—A subject can be involved in more than one activity simultaneously; *e.g.*, he may ask to have the barrier raised while swinging the fish line; in these cases we speak about "overlapping regions of activity." A type of overlapping behavior of special importance to us exists when play and nonplay activities overlap. We will call this "secondary play." Primary play, on the other hand, occurs when the subject gives the play his complete attention.

Substitute Behavior.—Passive barrier and escape behavior frequently seemed to be in the nature of a substitute for playing with the inaccessible toys or for leaving the experimental situation. This was particularly true of conversation about the inaccessible objects. Active barrier and escape behavior also seemed sometimes to be a substitution; *e.g.*, "fishing" through the barrier, throwing the accessible toys into the inaccessible region, playing that the accessible portion of the room was a part of the inaccessible part, etc.

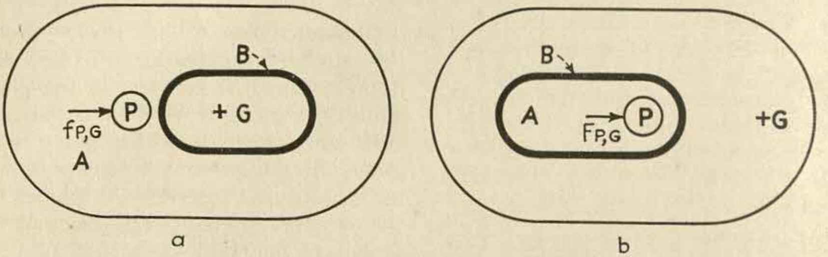

FIG. 4.—Topology of a frustration situation. *P*, person; *G*, goal; *B*, barrier; *A*, space of free movement; $f_{P,G}$ force toward the goal. (*a*) The barrier surrounds the goal; otherwise the person is free. (*b*) The barrier surrounds the person.

Emotional Behavior.—Two sorts of emotional expression occurred: (*a*) "pure" emotional actions, *e.g.*, whimpering, whining, restless actions, and (*b*) strong "emotional component" to barrier and escape behavior, play, etc.

Topology and Dynamics of the Frustration Situation.—The simplest way to approach the situation of frustration is probably to treat it as a particular case of a limited space of free movement (4). The space of free movement, *i.e.*, the totality of accessible regions, may be limited by either an "inner" or an "outer" barrier or by both. In the first case a goal region (*G*, Fig. 4*a*), a region with positive valence, is surrounded by a barrier region (*B*) separating it from the individual (*P*), who is otherwise free. In the second case the individual is surrounded by a barrier, the goal being outside (Fig. 4*b*).

For most of our subjects, Fig. 4*a* seems to be an adequate representation for the early periods of the frustration situation, *i.e.*, the subject sees himself separated from the fine toys without otherwise feeling himself to be in a prisonlike situation. Later the situation usually changes to that represented in Fig. 4*b*; he becomes imprisoned.

The barrier has for the child either the character of an "objective" physical obstacle or the character of an obstacle which is created and kept in place by the experimenter, *i.e.*, a social barrier. Frequently it is a combination of both. This is why the action toward the inaccessible toys often takes the form of both a physical attack on the barrier and a social approach to the experimenter.

Sample Record.—A part of a record will be given to acquaint the reader with the sequence and content of the course of events occurring during the experiment. This is the type of material with which we have had to work.

Child 22 is a girl fifty-three months old. Her I.Q. is 122.

Each unit of action is numbered consecutively. At the end of each unit the length of the unit in seconds is given and the constructiveness rating of the play. (Constructiveness ratings are discussed in the section immediately following.)

FREE-PLAY SITUATION

1. S.: "Here," to E., "you make me something from this clay."* She takes

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* In a few experiments a piece of modeling clay was included on the square with the crayons and paper.

clay to Square 1 and asks, "Where are the other things?" (Referring to the toys present in another experiment.) "I want you to play with me." The experimenter continues recording. Constructiveness 2; 45 sec.

2. S. throws clay onto Square 2. "This is an elephant." Then finding a small peg on the floor, "Look what I found. I'll put it at his eye." Looks at it. Makes elephant sit up. Constructiveness 6; 70 sec.

3. S. starts to draw. "I'm going to draw a picture. Do you know what I'm going to draw? That will be a house. That is where you go in." Constructiveness 7; 45 sec.

4. Someone moves in another room. S.: "Who is that?" 10 sec.

5. S. goes to Square 1, shakes phone, and examines it. Manipulates phone, pretends conversation but does not use words. ("How do . . . " are the only words that E. can distinguish.) Constructiveness 5; 30 sec.

6. S. sits down on chair and looks around. "I guess I'll sit here and iron." Repeats, then says gaily, "See me iron." Constructiveness 5; 45 sec.

FRUSTRATION SITUATION

1. S. watches E. lower the partition. She asks, "I will not play on the other side again?" E. answers, "You can play here now." S. faces the experimenter for about 15 sec. with hands behind her neck. 25 sec.

2. S. looks around. 5 sec.

3. S. goes to Square 3 and examines sailboat and fish pole. Constructiveness 2; 15 sec.

4. S. stands at Square 3 and looks at barrier. 5 sec.

5. Turning to the play material on Square 3, S. takes the fish line and dangles it about sailboat. Constructiveness 2; 20 sec.

6. S. goes to the barrier and reaches through the meshes of the screen. 5 sec.

7. S. turns around, looks at the experimenter, laughs as she does so. 15 sec.

8. S. goes to Square 3, takes the fish pole, and returns to the barrier. She asks, "When are we going to play on that side?" Experimenter does not answer. Then, in putting the fish pole through the barrier, S says, "I guess I'll just put this clear back." She laughs and says, "Out it comes!" taking pole out again. Constructiveness 2; 35 sec.

9. S. walks to experimenter's table. 10 sec.

10. S. goes to Square 2 and manipulates clay. Constructiveness 2; 10 sec.

11. From Square 2 she looks at the objects behind the barrier and says, "I do like the balloon," and then she asks, "Who put that house there?" E. answers, "Some of my friends." She asks again, "Who put that over there?" 35 sec.

Constructiveness of Play.—From this sample, the reader will gain an impression of the richness of the play which occurred. It is possible to use such manifold material for many purposes. In the present connection, we have been most interested in phases of the play that are related to the creative aspects of the child's behavior.

Constructiveness Scale.—For this purpose we have made an analysis of the play activities on the basis of their constructiveness. One can distinguish variations in the type of play on a continuum ranging from rather primitive, simple, little-structured activities to elaborate, imaginative, highly developed play. We speak in the former case of low constructiveness; in the latter, of high constructiveness. In our experiment, constructiveness was rated on a seven-point scale (2 to 8) devised to be applicable to occupations with all the toys.

To demonstrate the use of this scale, we present a few examples of various constructiveness levels with the same toy, the truck and trailer. Our remarks are not definitions of the various constructiveness levels. They are intended merely to point to some characteristics of these specific examples.

Constructiveness 2. The toys are examined superficially. Example: Sits on floor and takes truck and trailer in hand. 10 sec.

Constructiveness 3. The truck is moved to a definite place or from one place to another. Example: Phone, truck and trailer, manipulated and carried to window sill. 25 sec.

Constructiveness 4. This is a somewhat more complicated manipulation of the truck. Example: Truck and trailer backed under chair. 15 sec.

Constructiveness 5. This is definitely a more complicated and elaborated manipulation of the truck. Example: Truck and trailer unloaded, detached; pulled in circles, reattached, detached, reattached; pulled in circles. 45 sec.

Constructiveness 6. The truck is used as a means to haul other things. Example: Takes truck and trailer. "More things are going to be hauled." Puts cup, saucer, teapot on trailer. Talks to self. "Ride along, mister." To square 3. 60 sec.

Constructiveness 7. The meaning of the play is an extensive "trip" or another elaborated story in which the handling of the truck is merely a part of a larger setting. Example: "Here's a car truck, and it's going out fishing, so we have to take the trailer off. First, we have to go to the gas station. Toot! Toot! Now, he's going to the gas station. Ding, ding, ding." Gets gas. Now back for the trailer and the fish pole; child has truck and takes the motor boat. Attaches it to truck and trailer. "Hmmmm! Here he goes." Behind Square 2 to 1. "Quack! Quack! Mr. Ducky come" (places on truck and trailer). Goes to Square 3. "Here's the sailboat." 225 sec.

Constructiveness 8. Play showing more than usual originality is placed here. Example: To Square 1. Truck and trailer reattached. "I'll bring them here." Detaches truck, has it coast down trailer as an incline, reattaches. 30 sec.

The scale was constructed in the following way: The play units were transcribed serially upon cards which were grouped according to the toy or group of toys involved. Three persons working in conference arranged the play units for each toy in order of their increasing constructiveness. No attempt at independent ranking was made. The resultant order represented the consensus of opinion of the raters after discussion, disagreement, and compromise. It became evident that, irrespective of particular theories of "constructiveness," it was possible to agree upon the relative ranking of different play with the same toys.

The play units were briefly characterized and the characterizations set down in tabular form. Each rank order was assigned a numerical weight which in the final scale ranged from 2 to 8. This original table constituted the first constructiveness scale. The items were brief characterizations of very specific kinds of behavior; general categories were omitted. A record was then scored by assigning a numerical value to each consecutive play unit in the record in accordance with the rating given in the scale and weighted for the duration of the unit by multiplying by the time. The mean constructiveness of each child's play was determined by summing these values for the whole record and dividing by the total duration of play, *i.e.*,

$$\text{mean constructiveness} = \frac{\Sigma[\text{Cons. } (u) \times \text{Dur } (u)]}{\Sigma[\text{Dur } (u)]}$$

where Cons. (u) = constructiveness rating of a play unit.
Dur (u) = duration of a play unit.
$\Sigma[\text{Dur } (u)]$ = total duration of play.

Reliability.—We have two sources of evidence as to the reliability of the ratings of constructiveness. One is the correlation between the constructiveness of play in different parts of the experimental period. For this purpose we have computed the mean constructiveness of play in each consecutive third of each experimental record in free play. The product-moment correlations between the mean constructiveness of play in the various thirds of the period are as follows:

Third of period	Correlation
1st and 2d	.72 ± .06
1st and 3d	.39 ± .10
2d and 3d	.48 ± .10

It will be pointed out later that the psychological situation was not stable throughout the experimental sessions and that it was necessary to take into consideration the changes which occurred. The above correlations are indications not primarily of the reliability of the ratings, but of the stability of the function involved. The correlation between constructiveness in the first and second third, *i.e.*, .72, indicates, however, even if the reduction from 1.00 results entirely from unreliability of the constructive ratings, that they have a reliability sufficient for the group comparisons here involved.

Another source of evidence of reliability of the constructiveness ratings involves the use of a method which approximates the so-called "split-half" procedure used in questionnaire studies. There the score obtained by using the odd-numbered items is correlated with that obtained when the even-numbered items are used. In the present case play units of different lengths are scattered at random throughout the records. We have taken advantage of this to secure two independent estimates of constructiveness based on different lengths of play units. First we computed the mean constructiveness of each child's play based only on play units of the following lengths in seconds: 1 to 15, 31 to 45, 61 to 90, and 121 to 180. We then determined the mean constructiveness of each child's play on the basis of play units of alternative lengths, *i.e.*, 16 to 30, 46 to 60, 91 to 120, and 181 sec. long or more. The correlation between these two independent estimates of mean constructiveness of play is .79 ± .05. The estimated reliability of constructiveness based upon all the play units is .88.

Validity.—If one intends to use constructiveness of play as an indication of the developmental level of a child and as an instrument for measuring the effects of regression, it must be demonstrated that, in normal children under comparable conditions, constructiveness increases with age. In other words, constructiveness of play, as determined by the constructiveness scale, should show a high correlation with age in a free situation. On the other hand, constructiveness is a characteristic of behavior which one would expect to show considerable variation from individual to individual of the same age. This means that constructiveness would be technically best fitted for our purpose if the correlation with age were high but sufficiently below 1.00 to allow for individual differences.

The product-moment correlations between mean constructiveness of primary play in the free-play situation and mental age is .73 ± .05. With chronological age the correlation is .79 ± .05. We have also calculated these correlations, omitting the data for four subjects who showed marked dissatisfaction in free play as indicated by a great amount of escape behavior. This dissatisfaction was taken to mean that these subjects were more or less frustrated in the free-play situation. Inasmuch as it was our intention to obtain the best possible estimate of the relation with constructiveness of *non-frustrated, satisfied* play, it was necessary to eliminate the subjects who did not satisfy these requirements. When they are eliminated the correlation with both mental and chronological age is raised to .81 ± .05. The mathematical regression of mean constructiveness of play upon mental age (months) in the free-play situation in linear; b equals .06.

These correlations are important insofar as they establish the fact that constructiveness of play varies positively with age between two and one-half and five years (thirty to eighty-two months mental age). Although the constructiveness scale is a first attempt and may be greatly improved technically, the degree of correlation with chronological age is not far from the value which would appear to be optimal for our purposes.

The first requisite for using constructiveness of play for studying regression seems therefore to be sufficiently met, and the constructiveness scale is valid at least in the degree to which it measures something related to changes in age levels.

Frequency of Various Activities in Free-play and Frustration Situations. Although the same types of behavior occurred in both experimental situations, their frequency of occurrence changed greatly from free play to frustration. The amount of time occupied with different activities is shown in Table 2.

Twenty-two of the subjects regressed in the constructiveness of their play, three did not change, and five increased.

Analysis of the results for primary play alone indicates that the mean regression in constructiveness, although less in amount, is statistically significant.

For the 10 younger subjects, twenty-eight to forty months of age, the regression is smaller than for the 20 older subjects, aged forty-two to sixty-one months. In the former case, the mean regression is 0.58 constructiveness points, corresponding to a regression of approximately 9.6 months mental age, and in the latter case it is 1.29 points, equivalent to 21.5 months mental age.

TABLE 2.—AVERAGE TIME IN SECONDS OCCUPIED BY DIFFERENT ACTIVITIES IN FREE PLAY AND IN FRUSTRATION

Activity	Mean time		Difference	$\frac{\text{Difference}}{\sigma\text{ diff.}}$
	Free play	Frustration		
Barrier behavior	19.50	510.50	+491.00*	11.47
Primary play	1144.17	569.83	−574.34	8.88
Secondary play	33.12	128.16	+95.04	4.00
Escape behavior	49.67	112.67	+63.00	2.68
Diversions	177.17	204.17	+27.00	†

* + indicates increase in frustration; − indicates decrease in frustration.
† Not computed.

Average Constructiveness of Play in Free Play and Frustration.—The mean constructiveness of the play of each child in free play and in frustration is shown in the correlation chart, Fig. 5. These data include all play, both primary and secondary. The mean constructiveness of play in free play is 4.99 constructiveness points and in frustration, 3.94 points. The mean regression is 1.05 constructiveness points with a standard error of .24, *i.e.*, the mean regression is 4.39 times its standard error. Stated in terms of mental-age equivalents, *i.e.*, in terms of the regression of constructiveness upon mental age, the mean regression amounts to 17.3 months of mental age. Proportionately, the per cent of decrease in functional level (as measured by constructiveness or mental-age equivalents) seems to be quite similar in the younger and the older group.

These data establish rather definitely the fact that a frustrating situation of the kind considered here reduces, on the average, the constructiveness of play below the level upon which it normally occurs in a nonfrustrating, free-play situation. Before considering how this reduction in constructiveness is effected it may be well to stress the fact that these crude results are of significance.

The results show that frustration not only affects actions related to the

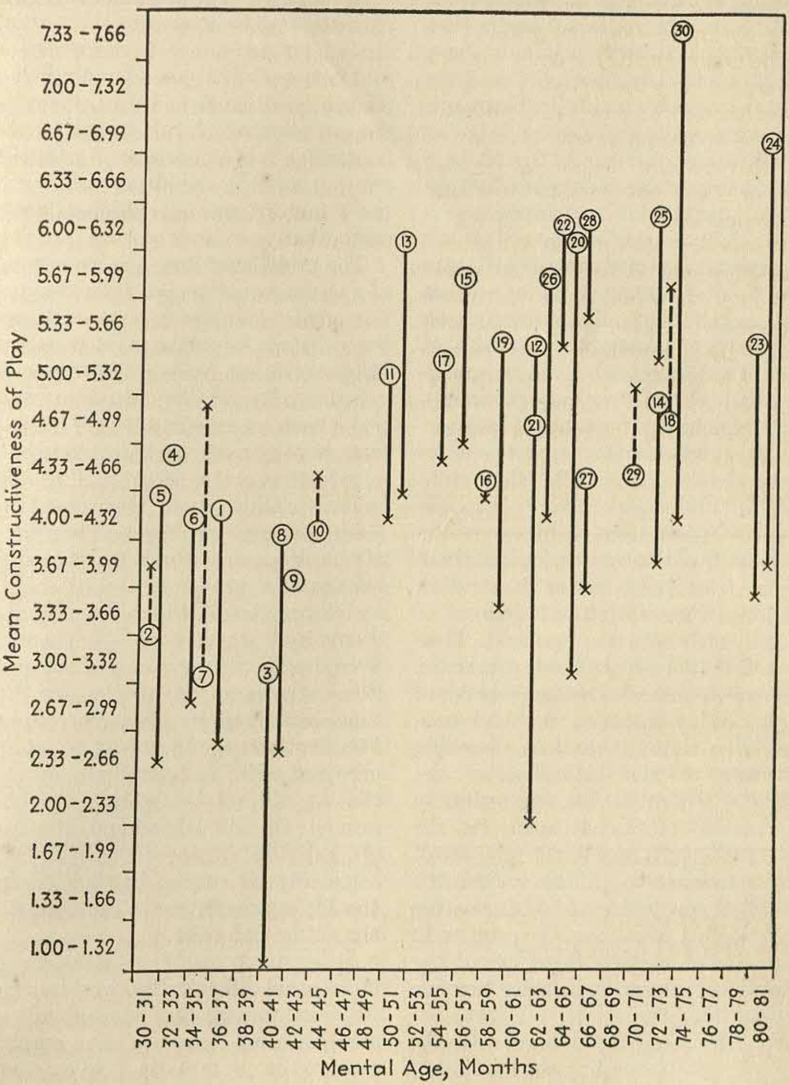

FIG. 5.—The relation between mean constructiveness of play and mental age and the change of constructiveness in the frustration situation. (1) The mean constructiveness of (primary plus secondary) play in the free-play situation is indicated for each child by a circle. The number given is that of the subject. (2) The mean constructiveness of play in the frustration situation is indicated by a cross. (3) Change in constructiveness from the free-play to the frustration situation is designated by a solid line when constructiveness decreases in frustration, by a broken line when constructiveness increases. The absence of a cross indicates no change in mean constructiveness for that child.

inaccessible goal, such as attempts to find round-about routes or aggression against the physical or social obstacles, but that it may affect behavior in other regions of activity as well. The main expectation of the experiment has been fulfilled. More specifically, the findings show the importance of the total situation for promoting or hindering a child's creative achievement.

Measurement of Strength of Frustration.—The technical arrangements were planned to provide frustration and free play. Inevitably, these effects were not secured in all cases, inasmuch as we had control over only the immediate, experimental situation and not over the expectations, anxieties, and various attitudes which the child brought to the experiment. In some instances frustration occurred in the free-play situation and in others there was no frustration in the frustration situation. In addition, all degrees of strength of frustration occurred. Thus far in the analysis we have proceeded as if the technical arrangements had functioned as intended with all subjects. The data have been classified according to the intention of the experimenters rather than according to the realities of the situation for the subject. We turn now to the analysis of some quantitative differences in the dynamical properties of the existing psychological situations. We propose to make use of certain measures of the strength of frustration in order to refine our data further.

We have been faced here with the necessity of determining the amount of frustration in the experimental situations. When such general aspects of situations are important, one notes a tendency to handle them in terms of nonpsychological concepts, *i.e.*, in terms of economic, social, geographic, and physical categories rather than in psychological terms. We have attempted to avoid this error and to describe and measure in psychological, behavioral terms.

In doing this we are faced with two problems: (*a*) to determine the strength of the frustration which is created by prohibiting the subjects from reaching the inaccessible toys; (*b*) to determine the extent to which this background of frustration is of importance for the play activity of the children. Obviously, these factors are not independent of each other.

The problem of how the background of a situation influences behavior in an immediate situation is a general problem of prime importance. It is particularly significant for what is frequently called the larger life situation which plays such an important role in problems of personality and development.

An attempt to solve this problem touches rather basic theoretical and methodological problems. The regions of the life space which constitute the background are not a part of the activity regions in which the individual is involved at the time. They are not overlapping with the immediate situation in the same way as the two situations in secondary play, for example. Frequently the subject will be so fully occupied with his immediate situation that he will not be aware of the background. On the other hand, the background still influences the behavior in some way. It cannot be omitted from the life space, if one is to account for the actual behavior.

It seems possible to clear up this conceptual difficulty by considering the implications of the concept of contemporaneity (4). In an empirical science the concept of a field existing at a given moment actually does not refer to a section without any duration through the flow of events. Even in physics it is impossible to describe such essential properties of a situation as the velocity of a point without treating the momentary situation as a segment which has a certain duration. Here it may suffice to say that in psychology, too, the situation existing at a given moment cannot be described without referring to a certain time depth. There seems to exist in psychology a definite relation between what one might call the "size" of the situation and the minimum extent of time which has to be taken into account in describing the "momentary" situation. To describe the state of the immediate situation a shorter period can usually be taken into account than if one has to describe the state of a larger situation.

These considerations open up a technical way to treat problems of background without resorting to new concepts. We merely have to realize that statements concerning overlapping situations should always be related to a situation of definite size. An individual may be involved in two overlapping activities within the immediate situation, as in secondary play (*e.g.*, play with the truck while talking about the nursery school). However, it is possible that the immediate situation does not have the character of an overlapping situation (*e.g.*, complete attention to truck play), while at the same time the more inclusive life situation does have this character (*e.g.*, "games" with the experimenter overlaps with nursery-school situation). It seems to be conceptually permissible and, as we shall see, technically fruitful to treat the effect of the background upon behavior as an inclusive overlapping situation, involving the immediate situation and the background. Thus, the concept of relative potency (5) can be used to characterize the influence of the background and of the immediate situation on behavior.

The problem of determining the amount of frustration becomes, in terms of these concepts, one of measuring the potency of the overlapping frustrating and nonfrustrating regions. We have taken as a symptom of the potency of an overlapping region, in the case of successive rather than simultaneous actions, the relative proportion of the total time occupied by the behavior to which the situation in question is coordinated. In the present case, this means that we have assumed that the potency of the frustration region is indicated by the proportion of the total experimental period occupied by frustrated behavior (barrier and escape behavior). It should be mentioned again that the inaccessible toys are not the only source of frustration. Frustration arises also when the child is prevented from leaving the experimental room, and it occurs even in the free-play situation. However, there is some indication that much of the escape behavior in the frustration situation derives from the separation from the inaccessible toys. Whatever the source of the need to leave the room, it, in its turn, leads to frustration and must be included in the total estimate. The estimate of the potency of frustration is therefore based upon the sum of both barrier and escape behavior.

Inasmuch as we are here concerned with the *change* in potency of frustration from the free-play situation to the frustration situation, we have limited ourselves to a consideration of the *difference* in the amount of time occupied with frustrated actions in the two settings. The 10 children for whom the increment of potency of frustration from the free-play situation to the frustration situation is least, *i.e.*, those for whom the increment in duration of frustrated behavior is less than 450 sec., are considered together as the "weak" frustration group. The 20 subjects for whom this increment is greater are dealt with together as the "strong" frustration group.

Constructiveness of Play in Strong and Weak Frustration.—There is a highly significant reduction in the constructiveness of play in the frustration situation in the strong frustration group, amounting to 1.46 ± .15 constructiveness points for primary and secondary play and 1.11 ± .15 constructiveness points for primary play. The first is equivalent to a regression of twenty-four months' mental age, the latter to a regression of nineteen months' mental age. With the weak frustration group, on the other hand, there is a small and not significant reduction in constructiveness, amounting to 0.23 constructiveness points for primary and secondary play and 0.12 points for primary play. When we consider both primary and secondary play, every child of the strong frustration group shows a decrease in average constructiveness during the frustration situation. The cases showing increase all fall in the weak frustration group. When only the primary play is considered five of the seven exceptional cases fall in the weak group and only two in the strong group. These results suggest that most of the exceptions are due to differences in the dynamics of the situation, *i.e.*, to differences in the potency of frustration.

Any doubt that real frustration, such as occurs with the strong group, leads to a significant reduction in constructiveness is dispelled by these data. It should be kept in mind, in this connection, that the selection of the strong and weak frustration groups was made on the basis of the time spent in barrier and escape behavior, a criterion which had no direct relation to level of constructiveness. The strength of frustration and the amount of regression are measured independently. Perhaps it should be emphasized, too, that these groups were not made until after the experiments were made, the records completed, and the mean constructiveness determined. Both groups were treated in all respects the same.

When the analysis is carried further and episodes of strong and weak frustration within the experimental sessions are treated separately, the magnitude of the effects of strong and weak frustration is increased.

Emotion and Regression.—*Pari passu* with the shift in constructiveness of play there occurs a change in emotional expression. In frustration there is a decrease in freedom of expression, *i.e.*, in the self-revealing actions. This is revealed by a decrease in play monologue and friendly conversation with the experimenter and by the frequent occurrence of masking or tactical, social behavior. There is a decrease in the happiness of the mood in the frustration situation; happy emotional expressions decrease in frequency and unhappy expressions increase. In frustration there is an increase in motor restlessness and hypertension as revealed by loud singing and talking, restless actions, stuttering, and thumb sucking. There is an increase in aggressiveness in frustration; hitting, kicking, breaking, and destroying all increase in frequency.

Theoretical Considerations

Theory in science has two main functions: (*a*) to open the way to new knowledge, and (*b*) to organize that which is known. The first and probably most essential function determines the fruitfulness of a theory. This function is fulfilled in the following way: the theory, which at first is stated in the form of an hypothesis, envisions unrevealed facts or relations or denies certain relations which are believed to hold; in other words, the theory predicts certain facts or relations of facts. This prediction is tested, usually through experiments. It is found to be valid or invalid. However, even if it has been found valid, the new data need not be treated in terms of the theory.

It is an essential characteristic of a fruitful empirical theory that it gives birth, as it were, to new knowledge, which is then independent of its theoretical ancestry. In an empirical science new data, although discovered by theory, are something in themselves which anyone is free to interpret theoretically in his own way or to accept as mere facts. In other words, the fruitful empirical theory is instrumental in establishing new scientific data which should be able to outlive the theory.

The main results which have been presented here have actually been predicted on the basis of a theory or group of theories. The experiment was set up to test the theoretical predictions.

Originally, our experiment was designed to test the prediction that tension in strong frustration leads to a dedifferentiation of the person and therefore to regression. This regression has been found. However, the experiments have shown that, aside from dedifferentiation, other factors may enter. In other words, there are several possibilities of explaining the observed regression in a situation such as the one studied here. We shall leave it open which factor or which constellation of factors has caused the results. Probably different factors were important for different subjects.

One of the best symptoms for the increasing differentiation of the life space (including the person and the psychological environment) during development is the increasing variety of behavior. In the frustration situation the richness and complexity of the play activity definitely decreases. This regression may be caused by dedifferentiation of the individual, in which case the spreading of tension is probably important. It can be shown that the degree of differentiation of a whole is inversely related to the strength of the pressure of tension when this pressure passes certain limits that are determined by the strength of the boundaries of the natural parts of the whole. Constructiveness in play decreases with the strength of the frustration because frustration causes tension.

A decrease in the variety of behavior must also occur if a part of the whole is kept in a fixed state. This follows from certain properties of a dynamic whole. The amount of decrease depends upon the extent of the fixed areas, their degree of centrality, and their divergency from the normal level. Frustration involving a particular goal keeps a certain part of the person in a state of more or less permanent tension, and the variety of all behavior should therefore decrease.

Change in organization can be derived from the overlapping between play and barrier behavior. To be governed by two strong goals is equivalent to the existence of two conflicting controlling heads within the organism. This should lead to a decrease in degree of hierarchical organization. Also, a certain disorganization should result from the fact that the cognitive-motor system loses to some degree its character of a good medium because of these conflicting heads. It ceases to be in a state of near equilibrium; the forces under the control of one head have to counteract the forces of the other before they are effective.

The extension of the life space, particularly in the psychological time dimension, is one of the essential characteristics of development. Planning presupposes time perspective. In the frustration experiment, the experimenter interrupted the elaborate play with the beautiful toys and caused the child to move to the other side of the partition. In the previous free-play situation the child had not been interrupted and may have become confident that his play would not be interrupted. With this security he was able to make relatively long-range plans. The interference at the end of the prefrustration period may have shattered the security and stability of the play situation. If the possibility existed that a superior power, such as the experimenter, might interfere at any moment, it might not seem worth while to develop a long-range plan. This should lead to a weakening of the connection between the reality and phantasy levels and to a narrowing of the life space with respect to its extension into the psychological future. It is possible to attribute regression in the frustration situation at least partly to this lack of security.

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CHAPTER XXVII

DOMINATION AND SOCIALLY INTEGRATIVE BEHAVIOR

HAROLD H. ANDERSON

Introduction*

The definitions of dominative and of socially integrative behavior have been derived from observations in schools and homes. From these observations certain assumptions and hypotheses have been formulated. Experimental and observational investigations carried on over the past several years reveal the possibility of practical application of the research to education.

The Teacher as Dictator.—A group of kindergarten children were making May baskets. Terry had folded his basket on the lines which had been drawn on the material the night before by the teacher. He had pasted the flaps as he had been instructed and had the handle fastened in place. The teacher had cut out of other paper a handful of diamond-shaped pieces which she had distributed four to a child. These were to serve as decorations to be pasted horizontally on the basket. As she walked about the room she noticed Terry pasting his diamond decoration vertically.

"Oh, oh, Terry," she said, "The decorations are to be pasted on lying down and not standing up."

"But I want to paste mine this way," said Terry.

"Well, that isn't the way they are supposed to go. Here now, just paste it this way." And she turned the diamond horizontally and pasted it before Terry seemed to know what had happened. She remained while Terry at her instructions pasted two more shapes horizontally. Then she turned away, leaving Terry to paste the fourth.

At the end of the period Terry had only three decorations on his basket. When the teacher inquired about his basket, Terry, pointing to the undecorated side of his basket, said that he did not want one there.

"Oh, but every basket should have four. Here is one your color. We'll just paste it on quickly." And with Terry speechless and transfixed she pasted it on quickly.

Mary Lou had observed that at her table several handles did not stick. "I guess I don't want a handle," she remarked to the boy seated next her. She cut up the handle of her basket and pasted the pieces as decorations all over the basket. The teacher's remark to this *fait accompli* was, "Oh, you've spoiled yours, Mary Lou; yours is all messy and doesn't have a handle."

Terry and Mary Lou were children who appeared to show a measure of spontaneity. Their behavior showed that they had ideas that differed from the expressed ideas of the "oldest and wisest" member of the group. Their behavior satisfies the criteria of being

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* The introductory material in this chapter has been adapted from an article by the writer (13). Further discussion of the definitions and assumptions and of the relation of domination and socially integrative behavior to the concept of growth are found in other publications (3, 9, 11, 12).

"experimentally minded," of "thinking for oneself"—important aspects of growth and basic objectives of education. Terry's spontaneous idea was nipped in the bud. Mary Lou's idea was translated into action which was subsequently disapproved.

Can children have ideas different from those of teachers? If so, under what circumstances and how often?

The Democratic Process in the Child Guidance Clinic.—By contrast with the relationships outlined above is the "therapeutic relation" between the child and a psychiatrist described by Frederick H. Allen. Writing on *The Child as the Therapist Sees Him*, Allen says,

> First, I might indicate the nature of the therapeutic relation with a child . . . This is a specific and unique relation established with a child who is presenting some difficulties in his behavior. Usually he is brought and has had little to say as to whether this is a thing he wants to do. From the beginning the therapist tries to give the child the feeling that here he is taken just as he is. He is accepted as a child, not as a problem, with no attempt to mould him into anything other than what he can be at the moment . . . (1, pages 3–4).

It is obvious that Terry and Mary Lou were not "accepted as they were" and that they were definitely being "moulded into something other than what they would have been at the moment."

That a relationship in which one is "accepted as he is" may be specific and unique for the children in difficulty who are brought to Dr. Allen's clinic may be true (2). That this relationship which Allen attempts for the clinic is not uncommon in many schoolrooms where children are not (or not yet) in trouble is also true.

The Democratic Process in School.—In a second grade during singing period one of the children asked for the song about the organ-grinder and the monkey. Another child volunteered the page number. After the children had sung it, the teacher asked, "I wonder if you would like to play it (act it)?" There was general agreement. The boy who had asked for the song was to choose the organ-grinders. He designated three, who in turn chose their monkeys. Two monkeys had been chosen. James was hesitating, although several hands indicated that he could have a monkey.

"Why don't you choose, James?" the teacher asked.

James looked over the room again and said, "I want a little person and I want somebody who wants to be a monkey." A hand shot up from a little girl who fitted James's specifications and she became the third monkey.

After the children had sung the song while the organ-grinders and their monkeys performed at the front of the room a child asked, "Don't they go down the street?"

"The organ man decides that," the teacher replied. The organ-grinders and the monkeys and the other children together seemed to decide it. The monkeys and the organ-grinders took positions at the head of aisles and the other children began to reach with ostensible gestures into imaginary purses for imaginary pennies to drop into imaginary cups. They sang the song again and the teacher, adding her imaginary pennies remarked, "Well, I hope you enjoyed their song, and that the monkeys received lots of pennies."

Socially Integrative Behavior: Harmony of Differences.—It is possible reliably to observe and classify the contacts between individuals as to whether the response on the one hand is characterized by a flexibility toward the other or is characterized by a rigidity. A flexible response is one which not only permits but invites interplay of differences; permits and invites the exercise of thinking and judgment of another. By its nature a flexible response brings out differences in the process of interplay, promotes the process of differentiation which is a fundamental characteristic of growth.

The teacher in the organ-grinder situation showed numbers of contacts with children in which it was easy for the child to be himself, to have ideas of his own and to act on them. To the extent that behavior can be characterized by this spontaneity and flexibility the social interplay reflects harmonious relations. Because it is easy to be oneself it is easier to be understood by others. The increased understanding that is brought about makes it possible for individuals to adapt their own behavior to the desires and purposes of others. It is axiomatic that without understanding it would be only by chance that one's behavior could be harmonious with the desires and purposes of others. It follows that harmony of social relations can exist only in proportion to one's understanding of others. If understanding is possible only to the extent that others are free to express themselves, be themselves, then accepting others as they are is not only a good psychotherapeutic technique, but a highly desirable educational technique as well.

The term "socially integrative behavior" is applied to responses characterized by flexibility, to behavior which attempts to bring out differences in others and to find common purposes among differences. It is essentially growth behavior in which one can at the same time be spontaneous, have ideas of one's own, and be harmonious with others; or, more properly, behavior is socially integrative to the extent that it is characterized by spontaneity and harmony.

The term "integration" is not used here as it has been used by some in contrast with differentiation. It is believed that the two processes are inseparable and are merely different aspects of the same psychological or biological phenomenon. With the integration of differences something new is created that has not existed before; this emergence of an original through the integration of differences is itself a differentiation.

Dominative Behavior: Conflict of Differences.—On the contrary rigidity of response tends to stifle differences in others, to reduce the interplay of differences, and hence to make understanding more difficult. The rigidity of response has been given the label of "domination." It designates relationships in which the determination of social behavior of two or more persons is founded on a narrow experiential base. Terry's experience, his desires, and purposes were excluded by his kindergarten teacher when she determined how Terry was to decorate his basket. Because the decision was made by the teacher alone, the experience in making the basket served more to create a conflict of differences than to permit the discovery of common purposes among differences. Domination unquestionably exists in degrees. The more authoritative and autocratic are human relations in any group the narrower is the experiential base out of which behavior of its members is determined.

The Development of the Methods

The Measurement of Teacher Behavior. *The Recording as Dominative or as Integrative Behavior.*—The definitions of the categories of teacher behavior have passed through several stages. They were originally derived from the concepts of dominative and of socially integrative behavior which were formulated for the experimental measurement of the social interplay of preschool children. Categories of teachers' dominative and socially integrative behavior were first developed at the kindergarten level (8, 9).

Helen M. Brewer (14) undertook the task of discovering what difference the teacher's behavior made to kindergarten children. She recorded the child's behavior simultaneously with a recording of the teacher's contacts as previously defined. However, instead of observing the teacher and recording the teacher's contacts with all the children, she used a more time-consuming method of observing one child at a time and recording in addition to the child's behavior all the dominative and integrative teacher contacts with that child.

a. Reliability of Observer.—In a study such as this, which uses an observational method, before data can be collected as a measure of the subjects to be studied it is necessary to ascertain the degree of reliability of the observer. One would like to know, for example, whether the observer would consistently mark the same behavior in the same place on the record blank. In the first reports of the measures of teachers' dominative and integrative behavior the reliability of the observer was presented in detail from four different approaches:

1. Reliability in observing a contact and in speed of recording.
2. Reliability in recording contacts with individual children.
3. Reliability in recording individual categories.
4. Reliability in recording all the contacts per category per child (9, pages 309–320).

b. Consistency of the Sampling.—By the method first developed wherein the observer watched the teacher and recorded her contacts with each child it was found that from 300 to 400 min. was sufficient to afford a representative sample of the teachers' contacts with individual children (9, page 328).

The Recording of Degrees of Domination and of Socially Integrative Behavior. During the early experimentation with the categories of teacher contacts it was kept in mind that the ultimate objective was to measure behavior in the teacher that could be demonstrated to make a difference in the behavior of the child. It was felt that the validity of the measures of teacher behavior would be much higher if the definitions of categories could sort out and distinguish the teacher contacts that would be highly related to the child's classroom behavior from those contacts that would be unrelated or only remotely related to child behavior. Some dominative contacts appeared to be so indifferently received by the child as to be innocuous; certain contacts defined and recorded as integrative behavior appeared to be so perfunctory as to offer no encouragement whatever to the child's spontaneity or initiative. The best criterion to use seemed to be the presence of some active observable response in the child. It was assumed that teacher domination was more "intense" when the child was showing some active resistance to it than when there was no observable evidence of resistance in the child's behavior. It was also assumed that a teacher's integrative contact showed a "higher degree" of common purpose when there was objective evidence in the child's behavior that the child was working with the teacher than it did with no such evidence.

Teachers' contacts continued to be recorded as dominative or socially integrative behavior. But within these large divisions, categories of teacher contacts were separated into situational groupings to indicate respectively degrees of domination and of social integration.

Three degrees or types of domination were designated:

A. Domination with evidence of conflict.

B. Domination with no evidence of conflict.

C. Domination with evidence of working together.

Three degrees or types of integrative behavior were designated:

D. Integration with evidence of conflict.

E. Integration with no evidence of working together.

Sept. 1940 H. H. Anderson
J. E. Brewer
Department of Psychology University of Illinois

Child________________________________ Teacher__________ Observer__________
School_______________ Grade_______ Obs. began__________ Date__________
Activity:

A-1		
2		
3		
4		
5		
6		
7		
11		
B-1		
6		
7		
8		
9		
10		
C-4		
13		
16		
23		
D-17		
E-18		
19q		
19s		
F-14		
16		
18		
19q		
19s		
20		

N.H.		
L. Up		
5. L. Sea		
6. Unid		
F. O.		
P-		
N-1.		
2.		
M-		
L-1. Ans. S		
2. H		
3. Ans. B		
4. F		
K-1. See H		
2. Pl Ex		
3. Con S		
4. Con O		
	V	R
J-1. Tell E		
2. Br		
3. Sug		
4. Off S		
5. H		
6. Ap		

FIG. 1.—Record blank for teacher behavior and child behavior.

F. Integration with evidence of working together.

In each instance the behavior of both teacher and child at the time were considered by the observer in determining in which category and in which type of teacher behavior to record a given contact.

Conflict was said to exist when the child by verbal expression or physical action indicated a goal or desire of his own and in which the teacher's behavior expressed an attempt to obstruct his pursuit or achievement of that goal or desire by imposing her own wishes or goals.

Evidence of *working together* consisted in verbal or other expressions which indicated that both teacher and child were pursuing the same goal or were trying to find a common purpose without the *imposition* of goals, desires, or ideas of the one on the other. Thus, in recording the teacher's behavior this evidence could come only when the teacher attempted to cooperate with a child in an activity in which he was already engaged or after the child had given indication that he accepted the teacher's ideas or goals as his own. The acceptance of the teacher's goals or problems did not include obedience or conforming under duress.

a. Method and Procedure for Gathering Data.—The categories of teacher contacts defined below represent a refinement in the earlier methods of recording the teacher's classroom behavior. The refinement, however, was made in the hope of recording the behavior of the teacher that could be shown to make a difference to the children. It was thus planned to use a record blank on which tallies of teacher contacts and of child behavior could be recorded simultaneously. The categories of child behavior and that part of the observation blank on which child behavior is recorded were devised by Joseph E. Brewer (15). Figure 1 shows the record blank originally used in the study by J. E. Brewer and subsequently used in studies by Anderson,* Reed (16), and Anderson and J. E. Brewer.†

The observation blank was designed to record observations for a 5-min. period. The observer sat near the front of the room at the side, where he could see the children's faces. He observed one child at a time, recording in tallies in the column at the left the teacher's contacts with that child as a member of a group. A "group" in this sense included any number of children from two up to the entire enrollment. These tallies are referred to as teacher's *group contacts.*

In the second column from the left were recorded the teacher's contacts with the child as an individual person. These tallies are referred to as the teacher's *individual contacts.* In the column at the right side of the observation blank were recorded by tallies the child's behavior as observed during the 5-min. period. The categories of child behavior are defined below.

Children in the room were observed for one 5-min. period alphabetically in rotation for a minimum total of 2 hr. of observation per child. It is obvious that a child's total score for any category of teacher contact or for any category of child behavior represents a total obtained from nonconsecutive 5-min. observation periods.

b. Definitions of the Categories of Teacher Contacts.—Examples of the definitions of the categories of teacher behavior which comprise the six respective situational types of teacher contacts are given below. It should be pointed out that the full scope of the definition of each category is not represented by the selected examples which are presented here. Nor can the categories as illustrated by these brief examples be regarded as sufficiently complete to repeat the methods of recording with comparable results.

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* The teachers' dominative and socially integrative contacts in relation to children's classroom behavior at the fourth and sixth grade levels. (In preparation for publication.)

† Consecutive studies of teachers' dominative and socially integrative contacts with elementary school children and related changes in the children's classroom behavior. A paper presented at the meetings of the American Psychological Association, Northwestern University, Evanston, Ill., September, 1941. (In preparation for publication.)

A. *Domination with evidence of conflict.*

A-1. Determines a detail of activity under duress or in conflict.
T.: "Don't do it that way. I'll tell you what to do."

A-2. Direct refusal. Includes denial or direct contradiction.
A child asks the teacher if he can do something and the T. responds only with, "No."

A-3. Relocates child.
Telling the child to move to another part of the room.

A-4. Postpones with no reason given or future date set.
T.: "We can't do that now."

A-5. Disapproval, blame, shame, obstruction, or interruption.
T. calls on F. F. has lost the place and is looking for it.
T.: "F. has lost the place. (Check *A*-5-*X*.)* Go on M. (*B*-1)."

A-6. Warning, threats, conditional promises.
T.: "If you can't do what you're supposed to do, you'll have to go out in the hall."

A-7. Calls to attention. This is checked when T. has to repeat her calls to attention because of slow, indifferent, or negativistic children or children who "fail to hear."
T.: "J., face this way, won't you?"

A-11. Deprives of specific material, activity, right, or privilege. Includes punishment, sending out of room, keeping after school, sending to principal's office, and physical attack by T.
T.: "When I have to speak to you three times about being noisy, we have no story but get right into arithmetic."

B. *Domination with no evidence of conflict: B*-(1-8), *directive; B*-(9-10), *lecture method.*
The child's goals are not expressed. Included here are the routine mechanics of group management—administrative short cuts to a teacher-determined goal.

B-1. Determines a detail of activity (mostly of a routine sort with no evidences of conflict). Teacher introduces an activity or a subject for discussion.
T.: "I have some work for you to do."
T.: "Back to your seats."

B-6. Warning, threat, reminder (with no evidence of conflict).
T.: "I hope our hands won't make any noise; we couldn't hear the music, could we?"

B-7. Call to attention or to group activity.
T.: "Will G.'s class come to the chairs?"

B-8. Rations material. T. passes out papers or other materials or asks a child to pass them out.

B-9. Lecture method: statements.
A clear-cut distinction is difficult to make between *B*-9 or *B*-10 and *E*-19, statement regarding *possible* (though not expressed) interest or activity of child. *B*-9 includes statements that relate to the textbook or curriculum; they are given gratuitously in the absence of expressed interest of the child. In each case there is an implication that the child *ought* to know the content volunteered by T. and that he would be held responsible for it.
T.: "Columbus discovered America."

B-10. Lecture method: questions.
Includes only questions with predetermined correct answer: with "answer in the book" or in the teacher's experience. T. always

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* Explanation of "X" is on page 467.

has the answer before asking the question. T. is trying to see if the child's experience checks with that of T.

T.: "What do Indians make their children's clothes of?" (*B*-10.) Child gives an answer not in book.

T.: "It doesn't say so, does it?" (*B*-10.)

C. *Domination in working together.*

T. retains her "right" to make decisions or to determine the activity but works with an *expressed desire of the child.* Recognizes child's "right" to an opinion, but child does not make the final or the immediate decision.

C-4. Postpones with reason or consideration.

T.: "I'm busy now. You will have to ask someone else to help you."

C-13. Selects child for activity on basis of child's expressed interest. *Selects* implies expression of interest or desire by two or more among whom T. selects one of a group.

If only one child asks to do something and T. says "yes," check *C*-23.

C-16. Approval.

T. gives approval of *required* work. (If the work was not required but has been done on the child's initiative check approval as *F*-16.) The behavior is frequently observed in situations where the child must have the teacher's approval of one stage of his work before going on to the next stage.

T.: "That's correct, you may go ahead now."

C-23. Gives permission.

Permission represents a decision that is made by the teacher; it is an expression of control founded on a narrow experiential base. Permission is a response to the child's request, but it presupposes that permission has to be granted, that the child is not free to act otherwise.

T.: "Yes, you may get a drink."

D. *Integration in conflict:* This situation involves a change in goal of the teacher following the confronting of specific differences.

D-17. Accepting a difference.*

Making an exception to the "administrative short cuts to a teacher-determined goal"; *i.e.*, T. changes the goal or the method.

E. *Integration with no evidence of working together.*

The teacher may have a goal or problem in mind, but it is not apparent that she expects the children or a child to accept that goal or problem. The child has given no specific evidence that he is interested in what the teacher says or that he wants to do that which is suggested. The choice is left with the child. The teacher initiates these contacts.

E-18. Extends invitation (always teacher-initiated, in contrast with *F*-18).

T.: "Were there any interesting things brought into the room this morning?"

E-19*q*. Question regarding possible, though not expressed (in contrast with *F*-19*q*), interest or activity of child.

Child reads: "He cried with alarm." T. to group: "What does *alarm* mean to you?" (*E*-19*q* because it could mean several things.)

E-19*s*. Statement regarding possible, though not expressed (in contrast with *F*-19*s*), interest or activity of child.

T. tells own experiences, things she has done or seen.

F. *Integration with evidence of working together.*

There must be some objective evidence of direction of goals for both teacher and child. Child is "in" the situation; he has given some indication of interest or desire.

F-14. T. helps child to define, redefine, or advance a problem. There must be evidence that the problem has been stated or accepted by the child.

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* Data in this classification have been infrequent and in none of the studies have been given separate statistical treatment.

Child asks a question, *e.g.*, "Do you capitalize 'Day' in Thanksgiving Day?" T. says: "What do you think?" (*F*-14.)

T. to class: "Can anyone help J.?" (Check J., *F*-14-*Z*; group *E*-18.)

T. "Thanksgiving Day; that's one special day in the year, isn't it?" (Check J., *F*-14.)

"When I call your name, J., you are the only one who answers, aren't you?" (Check J., *F*-14.)

"I mean a specific J., don't I?" (J., *F*-14.) "Do you capitalize your name?" (J., *F*-14, because it was child's problem.)

J.: "Yes!"

T. "What do you think about Thanksgiving Day?" (J., *F*-14.)

J. "I think you capitalize it."

T. "Does that satisfy you?" (J., *F*-14.)

J. "Yes."

T. turns away.

F-16. Accord, approval, acceptance of contribution. This is a response to the spontaneous or self-initiated behavior of the child; approval where there can be several answers or new answers.

T.: "I think that everyone enjoyed your story, L."

T.: "S. has been so kind as to bring a picture of the bird we were talking about yesterday."

F-18. Extends invitation. (In response to child's wish, suggestion, or expression of need.)

Child comes to reading class to which he does not belong.

T. says, "You don't need to come to this class, B., but we will be very happy to have you if you wish to stay."

C.: "I have a safety-first book."

T.: "Perhaps there are some suggestions you might read to us."

F-19*q*. Questions regarding the child's expressed interest or activity.

Child shows Indian bracelet to the group. T. "Did the Indians make this?"

T.: "Was it a katy-did?"

F-19*s*. Statements regarding the child's expressed interest or activity.

T.: "I saw someone with a butterfly." (Group *F*-19*s*.)

Children are talking about smudge pots used in fruit groves. The teacher tells about receiving a letter from a friend who lives near the fruit groves and who describes the effects of the smoke on the curtains in the houses there. Each such statement is checked. (*F*-19*s*.)

F-20. Accepts responsibility for act that is inconvenient or unjust or unfair to another or admits own ignorance or incapacity.

T. starts to take papers away from child. "Excuse me, I thought that was extra."

T.: "It is hardly fair to ask V. when she was out of the room."

J. was asked to work a problem. He goes to board but can't do it. T. says, "J., I think you were absent the first day we took up those problems. (*F*-14.) Perhaps someone else can help you." (Group *F*-18-*Z*.)

X. *Teacher-contact fosters competition or adverse comparison.*

The symbol (*X*) is used to designate situations in which adverse comparison is made or competition is fostered. In the teacher's behavior it will usually involve an interplay between two or more children; more rarely it may involve competition between the teacher and another individual child or between the teacher and a group, or between two groups, one of which includes the teacher.

T.: "Let's see which row can be ready first." (*B*-1-*X*.)

T.: "I'm going to watch and see who sits up the nicest." (*B*-6-*X*.)

T.: "Well, it sounded like there were a lot of little kindergarten children in here." (*A*-5-*X*.)

T.: "I like the way J. is sitting; he looks so grownup." (*C*-16-*X*.)

Z. *Teacher contact recognizes or promotes cooperation or working together.*

Directly or indirectly calls for children to help another.

T.: "Would someone like to help H.?" (*E*-18-*Z*.)

Ch.	*Teacher allows the child a choice.* The symbol *ch* is always in addition to a tally in some category of teacher contact. Teacher contact allows the child some choice in the determination of a detail where the broader decisions are included among routine activities or are otherwise made by the teacher or the group. T.: "Write each word ten times. You may do it now or when you find time." T.: "You may print it or write it, as you please."

The Measurement of Child Behavior.—The categories of child behavior as defined for these studies are taken from J. E. Brewer (15).* Twenty-nine categories of child behavior were defined for use in the second grade after extensive preliminary observations in first-, second-, and third-grade rooms. After being used by J. E. Brewer at the second-grade level they have since been found applicable at the third, fourth, and sixth grades, in home-room schools, and in schools having departmental teaching.

> . . . One criterion that was kept in mind was to include in the categories only descriptive items of behavior that could be directly observed. Several categories do not directly involve the teacher, *e.g.*, nervous habits, looking up, dominating another child, child-child social contacts. These were thought to have some relation to the total situation or environment of the classroom, in which case they give indirect evidence of the effect of teacher-behavior. Behavior relating to the teacher was divided into main groupings that indicated the type of teacher-contact involved. Conforming, nonconforming, responses to lecture method or to recitation techniques, evidences of working on problems and "spontaneous" expressions of the child's own ideas and interests were differentiated. It was assumed that relatively high frequencies in those categories of conforming and lecture method responses would indicate more rigidly deterministic requirements of the room, while high frequencies of the "social contribution" or of problem solving would indicate that the children's desires and interests were being recognized as of importance in the social processes of the schoolroom.
>
> The child-behavior categories were developed in conjunction with the teacher-behavior categories. Some of the items were defined in terms of the child's response to one or more of the teacher-behavior categories. The categories were mutually exclusive as defined so that frequencies of different groups of categories could be added. Frequencies of behavior were recorded by checks or tallies (15, pages 19–20).

N.H.	*Nervous habits.*
L.Up.	*Looking up* at seatwork.
L.Sea.	*Leaves seat.*
Undet.	*Undetermined child-child contacts.*
F.O.	*Playing with a foreign object.* (Marbles, rubber bands, etc.)
P.	*Conforming* to teacher domination under *A* or *B* categories of teacher behavior.
N (1-2).	*Child domination of other children.*
N-1.	Demands, commands, uses force.
N-2.	Attacks status of other child.
M.	*Nonconforming* to teacher's commands or demands: resistance against teacher domination.
L (1-4).	*Response in recitation.*
L-1.	Answers spontaneously.
L-2.	Holds up hand.
L-3.	Answers when called upon.

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* The first study which undertook to discover the relation between teachers' behavior recorded as dominative and socially integrative contacts and child behavior in school was made at the kindergarten level by Helen M. Brewer (14). Teacher contacts as earlier defined (9) were recorded in frequency units. Child behavior was recorded partly in frequency units but mainly in time units as the amount of time spent in seven different activities.

L-4.	Fails to answer when called upon.
K (1-4).	*Problem solving.*
K-1.	Seeks help.
K-2.	Plans experiment.
K-3.	Contributes to own problem.
K-4.	Contributes to other's problem.
J.	*Social contributions by the child.* *v* indicates that the behavior was voluntary; initiated by the child. *r* indicates that the behavior was in response to an open question or invitation by the teacher or by others.
J-*v*-1; *J*-*r*-1.	Tells experience.
J-*v*-2; *J*-*r*-2.	Brings something to school.
J-*v*-3; *J*-*r*-3.	Makes suggestion.
J-*v*-4; *J*-*r*-4.	Offers services.
J-*v*-5; *J*-*r*-5.	Holds up hand.
J-*v*-6; *J*-*r*-6.	Shows appreciation.

Mental-hygiene Assumptions

Teacher Contacts.—It is to be noted that the types of teacher contacts from *A* to *F* are defined in such a way that the first-named type, *A*, *Domination in conflict*, and the last-named, *F*, *Integration in working together*, include behavior in which there is an active expression of motivation on the part of both the teacher and the child. In situations where the *A* contacts are recorded the child and the teacher are *working definitely in opposition* to each other; the end result for the child is commonly frustration of one kind or another. In *F* contacts the teacher is using her imagination and resources to carry out her immediate educational objectives by adapting herself to and facilitating an expressed interest or activity of the child; she is *working with* him in the direction of that interest or activity. Seven mental-hygiene assumptions have been made regarding teacher contacts.

1. It is assumed that the *working with* the child, the *rapport*, the *integration in working together* expressed in the *F* contacts, is of high mental-hygiene value.

2. It is assumed that the atomistic behavior, the *working against* each other, the intolerance, and the conflict recorded under *A*, *Domination in conflict*, is of extremely low mental-hygiene value.

3. For *A* contacts, *domination in conflict*, it is assumed that individual contacts are "worse" from a standpoint of mental hygiene than are group contacts. It is assumed to be a more severe experience to be singled out alone for disapproval, frustration, reprimand, or punishment than to be similarly treated as a member of a group.

4. It is assumed that high frequencies of all forms of domination are symptoms of unhygienic relationships.

5. It is assumed that high frequencies of *E* contacts, *integration with no evidence of working together*, are desirable, though from a mental-hygiene standpoint they are less important than high frequencies of the *F* contacts.

6. Domination-integration ratios are computed by dividing the mean total dominative contacts by the mean total integrative contacts. It is assumed that high *D-I* ratios are undesirable.

7. A "mental-hygiene quotient" can be derived from the assumptions in 1 and 2 by dividing the mean total frequencies of *F* contacts by the mean total frequencies of *A* contacts. It is thus possible to compute for the whole room a mental-hygiene quotient for a teacher's group contacts or for her individual contacts, or it is possible from the totals for each child to compute separate mental-hygiene quotients for each child. It follows from the first and second assumptions above that a high mental-hygiene quotient is desirable.

Child Behavior.—Certain mental-hygiene assumptions can likewise be formulated in respect to the categories of child behavior as defined.

1. It is assumed in general that high frequencies in category *J*, *Social contributions by the child*, are desirable.

2. It is assumed that there is a higher mental hygiene value in those social contributions which are *voluntary*, and which therefore would be expressions of the child's spontaneity and initiative, than in the social behavior which comes as a *response* to a request or invitation from another. There is some evidence of a need to qualify this assumption regarding the *J-v* categories as defined. Some of the voluntary social behavior has seemed to be expressions of highly competitive attempts to "get ahead" of someone else. To the extent that the voluntary social behavior as recorded expresses a lack of consideration for others that behavior is covered by the next mental-hygiene assumption.

3. Expressions of spontaneity and initiative in social behavior have mental-hygiene value to the extent that they do not act as a curb to the initiative and spontaneity in others. This hypothesis merely assumes that the operation of the democratic processes or the application of the golden rule are valued mental-hygiene processes.

4. High frequencies of problem-solving behavior as defined and recorded are assumed to be desirable.

5. It is assumed that high frequencies of either conforming or nonconforming are undesirable.

6. It is assumed that high frequencies or increases in domination of other children are undesirable.

It is difficult to make mental-hygiene assumptions regarding several categories of child behavior which seem not to be directly related to the teacher's behavior. *Nervous habits* as defined seem to be a part of normal child behavior. However, extremely high frequencies or large increases in nervous habits would probably be regarded as undesirable.

Look up at seatwork, *Leaves seat*, and *Undetermined child-child contacts* were descriptive categories containing many psychological unknowns.

Playing with foreign objects, to the extent that it represents resistance against restraint or lack of interest in schoolwork, should probably be regarded as a symptom of an unhealthy situation.

Application of the Methods*

Purpose.—This study was made in two third-grade rooms in the same school building. The aim was: (*a*) to compare the two rooms in the fall and again in the winter; and (*b*) for each room to compare the fall sampling of data with the respective winter sampling as to types of teacher contacts and as to child behavior.

Subjects.—The subjects were 64 children, 32 in each of two third-grade rooms in the same school building, and their two respective teachers. The children in the two rooms came from similar socioeconomic backgrounds; were similar in chronological age and intelligence; they were assigned to rooms by lot in the first grade and were promoted as rooms through the school system. The rooms and teachers have been designated *C* and *D*.

Methods and Procedure in Gathering and Analyzing the Data.—The methods of gathering data have been explained above. In this particular study the procedure followed for each room was to observe each child in rotation by alphabetical order for a 5-min. period until each had been observed for a total of 3 hr. of nonconsecutive 5-min. periods for the fall sampling and a total of 2 hr similarly recorded for the winter sampling. The data for 3 hr. of observation per child were gathered in the fall for a special study of consistency. For present purposes the obtained frequencies of teacher contacts and of child behavior in the fall sampling have been multiplied by two-thirds to give the rate per two hours of observation per child.

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* An example from a consecutive study of teachers' dominative and socially integrative contacts with elementary-school children and related changes in the children's classroom behavior, by the writer jointly with Joseph E. Brewer, General Education Board Fellow.

TABLE 1.—MEAN FREQUENCIES OF TEACHER'S GROUP AND INDIVIDUAL CONTACTS PER CHILD PER TWO HOURS OF OBSERVATION

Type of contact	Teacher *C*			Teacher *D*			Critical ratios			
	r	Means		*r*	Means		Fall	Winter	*C*	*D*
		Fall	Winter		Fall	Winter	*C–D*	*C–D*	*F–W*	*F–W*
	1	2	3	4	5	6	7	8	9	10
Teacher's group contacts										
A. Domination in conflict....	.09	6.20	8.44	−.35	26.48	26.34	14.91*	11.30*	2.67*	0.06
B-(1–8). Domination—directive....................	−.14	112.80	105.00	.26	105.25	100.72	1.42	0.70	1.19	0.10
B-(9–10). Domination—lecture method..................	−.14	96.32	88.72	.21	104.94	96.22	1.51*	0.93*	1.02	1.43
B. Domination with no conflict	−.21	209.10	193.72	.42	210.18	196.94	0.12*	0.29*	1.38	1.68
C. Domination with working together................	.23	1.87	1.00	−.20	6.44	5.97	9.65*	8.41*	0.45	0.66
Total domination..........	−.19	217.18	203.16	.29	243.10	229.25	2.64*	2.29*	1.25	1.51
E. Integration with no working together...............	.17	25.42	53.09	−.02	42.58	83.66	5.98*	6.12*	10.09*	8.40*
F. Integration with working together...............	.09	2.00	1.38	.27	7.28	4.06	7.66*	4.28*	1.60	4.55
Total integration..........	.14	27.42	54.47	−.08	49.86	87.72	7.56*	6.59*	9.76*	7.28*
Total contacts.............	−.15	244.60	257.63	.27	292.96	316.97	4.83*	5.36*	1.11*	2.78*
Teacher's individual contacts										
A. Domination in conflict....	.71	2.48	1.78	.40	5.72	5.47	3.18*	3.07*	1.60	0.02
B-(1–8). Domination—directive....................	−.04	3.90	3.28	.34	4.25	4.50	0.51*	1.41*	0.79	1.15*
B-(9–10). Domination—lecture method..................	.49	3.92	3.25	−.28	4.14	5.59	0.35*	2.25*	1.02	1.43*
B. Domination with no conflict	.42	7.82	6.53	.06	8.39	10.09	0.45*	2.17*	1.19	1.14*
C. Domination with working together................	.26	2.06	1.81	.36	3.02	2.47	2.22*	1.35*	0.72	1.39
Total domination..........	.58	12.36	10.13	.32	17.14	18.03	2.31*	3.21*	1.65	0.43*
E. Integration with no working together.............	−.05	1.42	2.91	.13	1.30	5.16	0.33	2.41*	2.68*	4.73*
F. Integration with working together................	.48	6.34	10.03	−.16	6.44	3.41	0.09*	4.05	2.83*	2.43
Total integration..........	.48	7.75	12.94	.32	7.72	8.56	0.00	2.34	3.78*	0.72*
Total contacts.............	.51	20.10	23.06	.40	24.88	26.59	1.76*	0.98*	1.25*	0.74*

* Indicates that the mean for the second sampling listed at head of column was larger.

The analysis of the data both for teacher contacts and for child behavior includes the following steps:

1. Determination of reliability of observers.
2. Study of central tendencies as revealed by mean frequencies both of teacher contacts and of child-behavior, together with the testing of the obtained differences between means for significant differences.
3. Study of the variability from the central tendencies as shown by individual differences in children.
4. Computation of coefficients of correlation showing
    a. Intercorrelations of types of teacher contacts.
    b. Intercorrelations of child-behavior categories.
    c. Correlations between types of teacher contacts and categories of child behavior.

Reliability of Observers.—Reliability of observers in the recording of teacher contacts and of child behavior was determined for each separate category by computing the percentages of agreement in the records of two observers who had made independent and simultaneous observations. Reliability of the observers was determined three times: in September and again in October for the fall sampling of data and in January for the winter sampling. During these three sets of observations tallies were recorded by one or both of the observers in a total of 127 categories.

The percentages of agreement for the respective combined categories of teachers' group contacts, teachers' individual contacts, and child behavior ranged from 86 to 93 per cent. Although the percentages of agreement in recording by separate categories are not reproduced here they were sufficiently high to justify the treatment of data by separate categories of teacher contacts and of child behavior.

TABLE 2.—MEAN FREQUENCIES OF CHILD BEHAVIOR PER CHILD PER TWO HOURS OF OBSERVATION

Category	Room *C*			Room *D*			Critical ratios			
	r	Means		*r*	Means		Fall	Winter	*C*	*D*
		Fall	Winter		Fall	Winter	*C–D*	*C–D*	*F–W*	*F–W*
	1	2	3	4	5	6	7	8	9	10
N.H. Nervous habits	.55	71.32	116.00	.31	65.66	99.66	1.50	2.73	14.32*	7.26*
L.Up. Looking up	.38	30.80	34.72	.35	25.90	30.72	2.15	0.59	0.22*	1.78*
L.Sea. Leaves seat	.61	5.25	8.06	.40	3.54	3.88	2.37	4.10	3.97*	0.67*
Undet. Undetermined child-child contacts	.30	50.34	83.81	.44	41.84	54.72	2.03	3.18	4.33*	3.34*
F.O. Foreign objects	.41	2.58	2.47	−.06	2.24	4.06	0.67	1.51*	0.35	1.67*
P. Conforming	−.20	49.82	40.00	.28	51.86	40.09	0.61*	0.00*	3.21	3.73
N-1. Commands other child		0.73	0.97		1.27	1.56	1.17*	1.31*		
N-2. Attacks status of other child		0.11	0.06		0.17	0.09	0.82*	0.43*		
N-(1–2). Dominates other child	.22	0.83	1.03	.08	1.44	1.66	1.32*	1.31*	0.54*	0.42*
M. Nonconforming	.45	4.00	2.28	.84	2.50	1.72	2.09	1.17	3.38	2.52
L-1. Answers spontaneously		0.75	0.34		2.46	1.31	3.41*	2.69*		
L-2. Holds up hand		8.04	5.75		7.42	8.28	0.56	2.99*		
L-3. Answers when called		5.04	2.97		9.59	11.38	3.33*	5.84*		
L-4. Fails to answer		0.56	0.22		0.42	0.53	0.58	1.29*		
L-(1–4). Response in recitation	.23	14.40	9.25	.21	19.88	21.50	2.93*	4.75*	3.75	0.77*
K-1. Seeks help	.43	4.04	5.94	.10	2.98	2.78	1.12	2.93	2.03*	0.28
K-3. Contributes to own problem		0.69	1.03		0.98	0.22	1.79*	2.38		
K-4. Contributes to other's problem		1.42	2.75		1.96	1.91	1.16*	1.38		
K-(3–4). Contributes own and other's problem		2.11	3.78		2.94	2.13	1.21*	2.23		
K-(1–4). Problem solving	.49	6.14	9.72	.34	5.92	4.91	0.20	2.90	2.76*	1.17
J-v-1. Tells experience		2.02	3.06		1.96	2.59	0.08	0.51		
J-v-3. Makes suggestions		1.31	1.41		3.02	3.47	1.83*	1.87*		
J-v-5. Holds up hand		1.23	0.91		1.19	0.81	0.10	0.29		
J-v-6. Appreciation		0.39	0.03		0.73	0.47	1.22*	2.10*		
J-v-(1–6). Voluntary social contributions	.55	5.36	5.53	.43	7.02	7.50	0.86*	0.93*	0.12*	0.29*
J-r-1. Tells experience		1.83	2.72		2.71	6.47	1.87*	3.61*		
J-r-3. Makes suggestions		0.61	0.22		1.27	1.53	2.04*	2.73*		
J-r-5. Holds up hand		1.89	1.78		1.83	2.78	0.12	1.85*		
J-r-(1–6). Social contributions in response	.07	4.46	4.72	.20	6.02	11.09	1.51*	4.19*	0.26*	3.68*
J-v- and *r*-(1–6). Total social contributions	.59	9.82	10.25	.34	13.04	18.59	1.24*	2.59*	0.28*	2.09*

* Indicates that the mean for the second sampling listed at head of column was larger.

Mean Frequencies as a Measure of Central Tendency. *Comparison of Rooms* C *and* D *in the Fall and Winter.* Table 1 gives for teachers' group contacts and individual contacts respectively, for rooms *C* and *D*, the mean frequencies per child per two hours of observation for the respective fall and winter samplings, together with four sets of critical ratios of the differences between means. Where the comparisons between fall and winter samplings involve the same teachers and the same children, conventional statistical methods for dealing with correlated measures have been used. Table 1 gives also the Pearson product-moment coefficients of correlation between fall and winter samplings respectively for rooms *C* and *D*. Table 2 gives comparable data for child behavior.

The *D–I* ratios and mental-hygiene quotients are given in Table 3.

TABLE 3.—DOMINATION-INTEGRATION RATIOS AND MENTAL-HYGIENE QUOTIENTS

	Teacher contacts			
	Group		Individual	
	Teacher		Teacher	
	C	*D*	*C*	*D*
D–I ratio				
Fall	7.92	4.88	1.59	2.22
Winter	3.73	2.61	0.78	2.11
Mental-hygiene quotient				
Fall	0.32	0.27	2.56	1.13
Winter	0.16	0.15	5.63	0.62

Fall Sampling.—The mean frequencies and critical ratios of the differences for comparing Rooms *C* and *D* are given in Columns 2, 5, and 7 of Table 1.

The data for *teachers' group contacts* are illustrated in Fig. 2. In the interpretation of this and the following graphs it should be explained that the columns for total domination and total integration are doubled in width in order to reduce by one-half the height. The mean frequencies for these columns are proportional to the area of the columns and are, therefore, twice the value given on the scale at the left. Keeping in mind the mental-hygiene assumptions, the following statements may be made about the group contacts of these two teachers in the fall: (*a*) With one exception Teacher *D* was more active in all types of group contacts, in most types significantly so. (*b*) Teacher *D* had a mental-hygiene advantage in significantly higher frequencies of total integrative contacts. (*c*) This advantage must be regarded as somewhat offset by the higher frequencies of total domination, a difference virtually significant. (*d*) Teacher *C* had a mental-hygiene advantage in significantly lower frequencies of *A*, *Domination in conflict*. (*e*) The mental-hygiene value of both teachers must be regarded with skepticism in that for both teachers the *F* contacts were low and for both were lower in frequencies than the respective *A* contacts. Both teachers *worked against* the children as a group more frequently than they *worked with* them. The mental-hygiene quotients for teachers *C* and *D* were respectively 0.32 and 0.27. (*f*) The *D–I* ratios for both teachers were fairly large, being respectively 7.92 and 4.88 for teachers *C* and *D*.

Figure 3 illustrates the mean frequencies for *individual contacts* in the fall. It should be noted that group contacts were much more frequent than individual contacts and that the frequencies for individual contacts throughout are plotted on a different scale. The following statements may be made about the individual contacts of these two teachers in the fall: (*a*) The two teachers were practically identical in their mean frequencies of both types of integrative contacts with individual children. (*b*) As in group contacts, teacher *D* is seen to be more energetic and active than Teacher *C*; but her greater energy and activity in individual contacts were shown entirely in more frequent domination of individual children, especially in domination in situations of conflict with individual children. For example, in 96 hr. of observation in Room *C* there was only one tally of physical contact as punishment of a child by the teacher. In Room *D* in 96 hr. of observation there were eight such tallies recorded; three each for a boy and a girl and one each for another boy and another girl. The contacts included slaps in the face and slaps on the head, recorded in category *A*-11 as *Domination in conflict*. It is assumed that where, as in the comparison of these two third-grade rooms, one teacher had twice as many *A* contacts as the other, this difference has represented not only a statistically reliable measure but a psychologically important difference. (*c*) With the *F* contacts for the two teachers showing virtual identity, the respective mental-hygiene quotients for teachers *C* and *D* were 2.56 and 1.13, the advantage for Teacher *C* being due entirely to her lower frequencies of *A* contacts. (*d*) The definite mental-hygiene advantage of Teacher *C* is reflected in the *D–I* ratios for Teachers *C* and *D*, which were respectively 1.59 and 2.22.

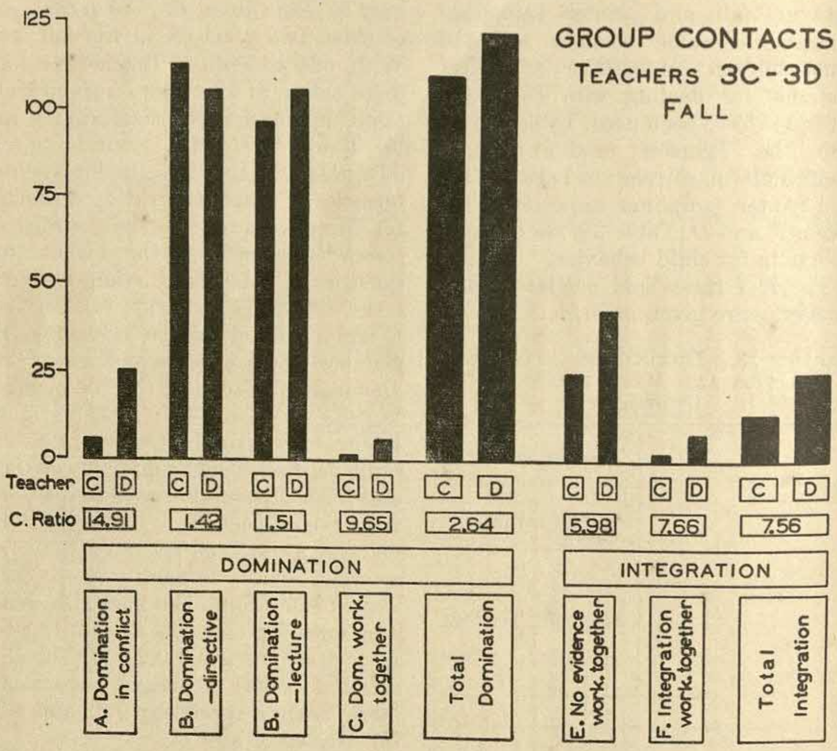

Fig. 2.

The data for *child behavior* are given in Column 7 of Table 2. There were only two categories of child behavior where the critical ratio was as much as three. These two categories, *L*-1, *Answers spontaneously*, and *L*-3, *Answers when called*, are defined as responses in recitation and, combined, represent the total of recorded reciting. The chief difference in child behavior between Rooms *C* and *D* in the fall was that in Room *D* there was significantly more reciting.

Winter Sampling.—The data for comparing the two rooms in the winter sampling are found in Columns 3, 6, and 8 of Table 1.

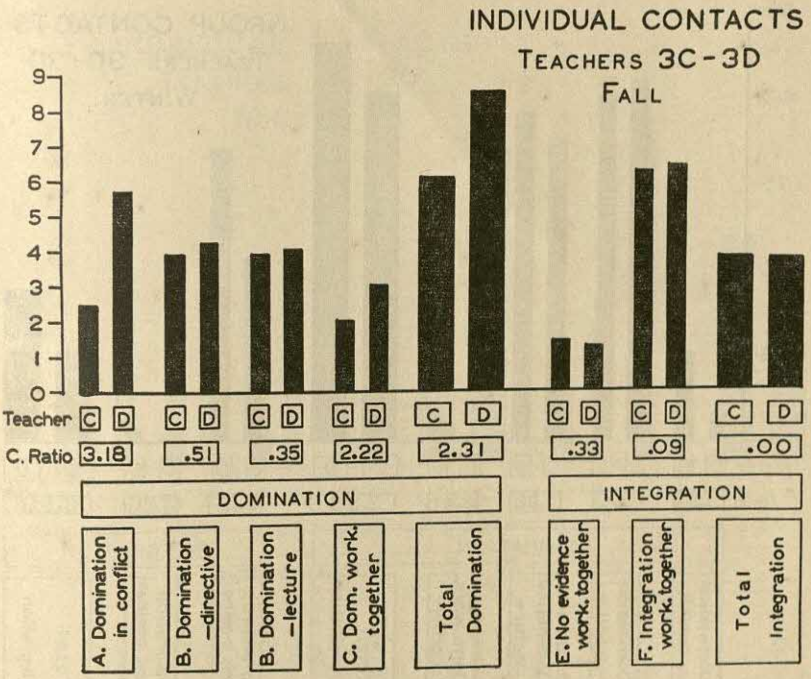

FIG. 3.

Figure 4 illustrates the data for *teachers' group contacts* in the winter sampling. As in the fall, the means for all types of teachers' group contacts, with one nonsignificant exception, were greater for Teacher *D*, the differences being large and significant or approaching significance. For both teachers mean frequencies of *F* contacts were very low, even lower than in the fall. The *A* contacts, however, had increased or remained the same. The mental-hygiene quotients for Teachers *C* and *D* were both very low, being respectively 0.16 and 0.15. The *D–I* ratios, respectively 3.73 and 2.61 for Teachers *C* and *D*, represented a decrease from the fall.

Figure 5 represents the mean frequencies of *teachers' individual contacts* in the winter sampling. Teacher *D* was again, as in the fall, without exception more dominating than Teacher *C*. But whereas in the fall the teachers had shown no reliable differences in either type of integrative contacts Teacher *D* in the winter was higher in her use of *E* contacts. In *F* contacts, however, the difference was even greater and reversed in favor of Teacher *C* to such an extent that the difference between teachers for *E* and *F* combined was virtually reliable. The *D–I* ratios for individual contacts, 0.78 and 2.11 for Teachers *C* and *D*, respectively, represented a definite mental-hygiene advantage for teacher *C*. This advantage was confirmed by an even greater difference in mental-hygiene quotients of 5.63 for Teacher *C* and 0.62 for Teacher *D*. In her contacts with individual children after having them in her room for 5 months Teacher *D worked against* them more frequently than she *worked with* them.

In the winter sampling the children showed striking differences in more categories of *child behavior* than in the fall. The children in Room *D* were against significantly higher in *Responses in recitation*. They had higher means approaching reliability in *Social contributions in response* to others, but were not reliably different in total *Social contributions* of a *voluntary* nature. They had dropped their lead in *Problem solving*, their lower frequencies in the winter representing a difference approaching reliability.

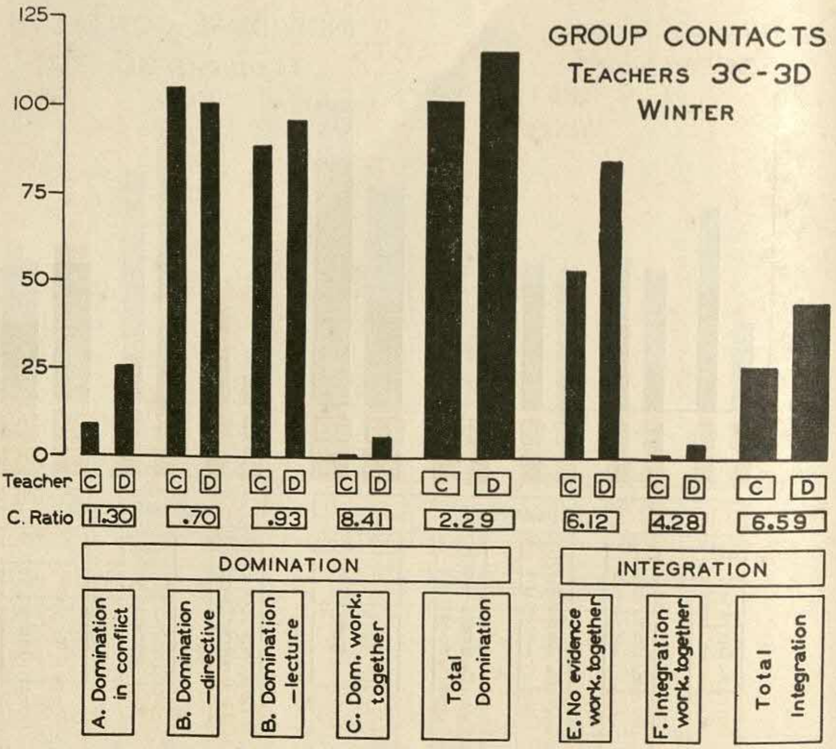

FIG. 4.

Comparison of Fall and Winter Samplings.—The changes in teachers and in children can be specifically noted in the comparison of each teacher and of each room in their respective fall and winter samplings. It should be noted that these comparisons deal with correlated measures.

Room *C*.—The data for the comparison of fall and winter samplings for Room *C* are given in Columns 1, 2, 3, and 9 in Tables 1 and 2.

The comparison of the *group contacts* of Teacher *C* in the fall and winter samplings is presented graphically in Fig. 6. In the mental-hygiene implications of these comparisons it can be seen that the several measured changes in the behavior of Teacher *C* are not consistent. (*a*) It would seem that Teacher *C* after 5 months has shown changes amounting to a mental-hygiene improvement in her group contacts, *viz.*, a significant increase in total integrative contacts and a considerable decrease in total group dominative contacts. (*b*) The increase in integration is entirely in *E* contacts, which in terms of the mental-hygiene assumptions must be regarded as less important than the *F* contacts. (*c*) The apparent mental-hygiene improvement was offset by definite changes for the worse in *A* contacts and in *F* contacts. In her group contacts Teacher *C* in both fall and winter *worked against* her children as a group, in conflict with them, more frequently than she *worked with* them. But in the winter she was *working against* the children more frequently than in the fall and was *working with* them as a group less frequently than in the fall. Teacher *C* dropped from a low mental-hygiene quotient of 0.32 in the fall to an even lower mental-hygiene quotient of 0.16 in the winter.

Not one of the coefficients of correlation for types of group contacts was statistically reliable. There was no tendency for the group contacts of Teacher *C* to be systematically directed toward certain children in both fall and winter samplings.

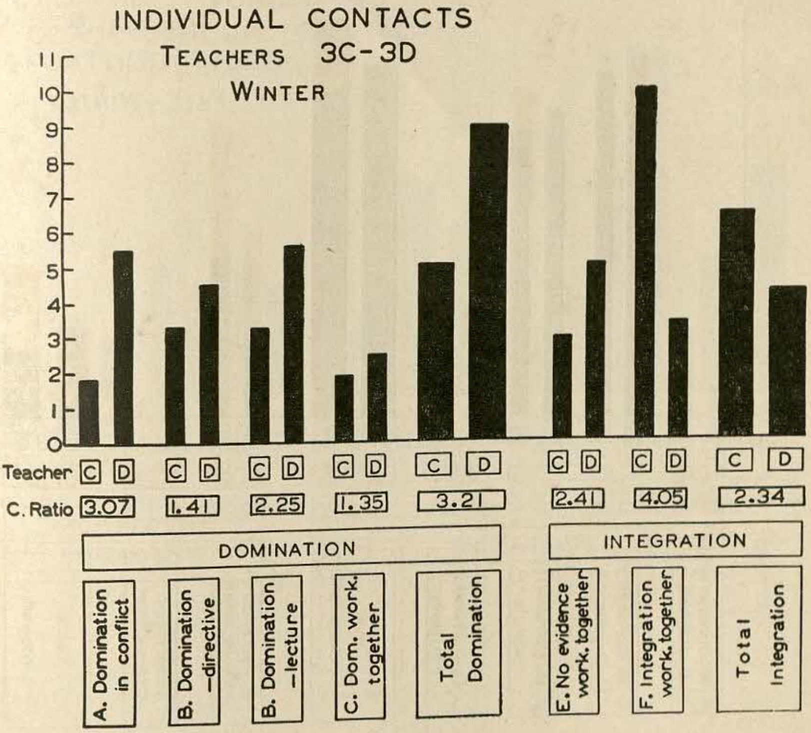

Fig. 5.

The *individual contacts* of Teacher *C* show that out of six coefficients of correlation for nonoverlapping data in the fall and in the winter three were statically reliable. The standard deviations for most of these data were rather large. A scatter diagram for the coefficient of .71 for *A* contacts revealed that one boy was mainly responsible for the high coefficient and that he was outstanding in the room for his high frequencies of individual domination in conflict with the teacher. Figure 7 illustrates graphically the mean frequencies of individual contacts for Teacher *C*. The changes can be said to be consistently in the direction of improvement from the standpoint of the mental-hygiene assumptions: (*a*) Significantly more total integrative contacts in the winter sampling. (*b*) consistently lower frequencies of total domination and of each of the types of individual domination. (*c*) Decrease in *A* contacts and increase in *F* contacts. The mental-hygiene quotient for individual contacts rose from 2.56 in the fall sampling to 5.63 in the winter. (*d*) Higher frequencies of *F* than of *E* or of *A*. (*e*) Change in *D–I* ratio from 1.59 in the fall to 0.78 for the winter.

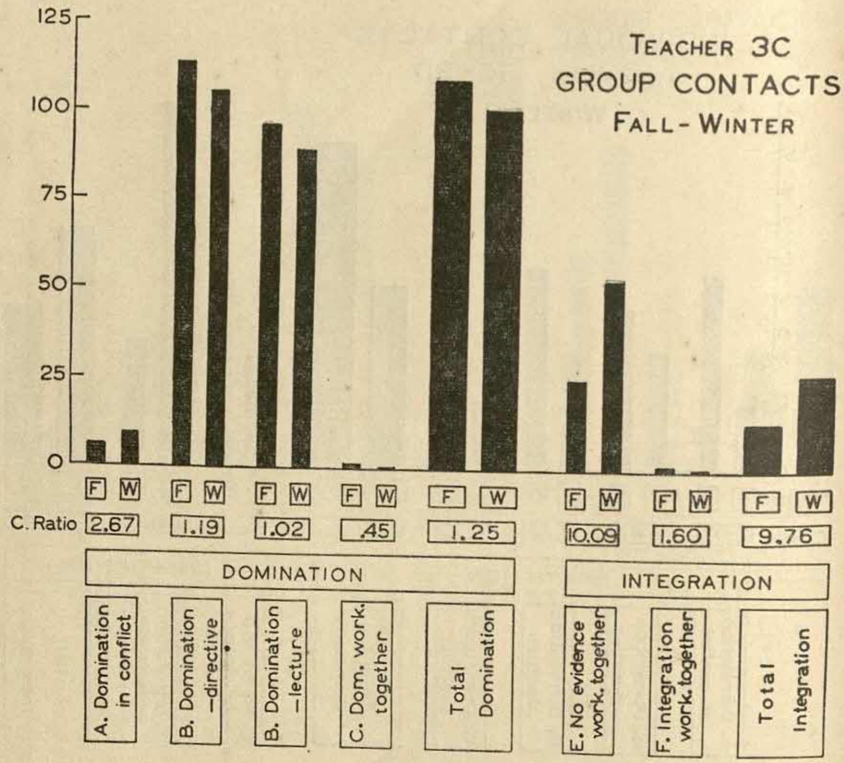

FIG. 6.

Scatter diagrams for some of the coefficients of correlation for *child-behavior* categories indicated a tendency for the reliable coefficients to be largely affected by the behavior of one or of two or three children. These influences were suggested by rather large standard deviations. Changes from fall to winter in the direction of a mental-hygiene improvement were found in significant decreases in both *Conforming* and *Nonconforming* and increases approximating reliability in the combined categories of *Problem solving*. That the mental-hygiene changes for the children as for the teacher were not entirely in one direction is shown by no change in *Dominates other children*, and no change in *Social contributions* either *voluntary* or *in response* to others. There was an actual decrease in *Answers spontaneously* in recitation.

Room *D*.—The data for comparing fall and winter samplings for Room *D* are given in Columns 4, 5, 6, and 10 of Tables 1 and 2.

For *teacher's group contacts* only one coefficient of correlation for group contacts was statistically reliable. The comparison of the means for group contacts is illustrated in Fig. 8. The changes in the group contacts of

Teacher *D* from fall to winter do not represent clear-cut mental-hygiene improvement. (*a*) It would appear that there was improvement in significantly higher frequencies of total group integration and a considerable reduction in total domination. (*b*) However, the increase in integration was entirely in *E* contacts, which represent suggestions arising from the teacher with no evidence of cooperation from the child. (*c*) In *F* contacts there was a significant decrease. Teacher *D* was actually *working with* the children as a group less frequently in the winter than in the fall. (*d*) There was no change in mean frequencies of *A* contacts. Teacher *D* was as often in conflict with the children as a group in the winter as in the fall. (*e*) The mental-hygiene quotient for group contacts dropped from a low 0.27 in the fall to a mere 0.15; this notwithstanding a decrease in *D–I* ratio from 4.88 to 2.61.

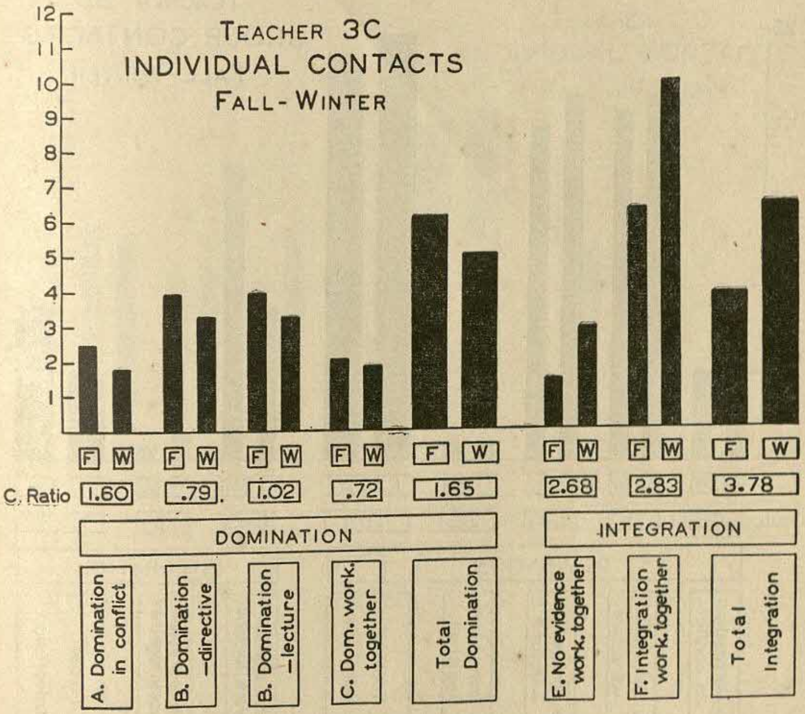

FIG. 7.

For *individual contacts* there was only one coefficient of correlation for non-overlapping data that was reliable; that was the coefficient of .40 for individual *A*, *Domination in conflict*. Figure 9 illustrates the changes from fall to winter in the individual contacts of Teacher *D*. In terms of the mental-hygiene implications the changes can be regarded only as a change for the worse. (*a*) There was no reliable change in total integration, in total domination or in *A*, *Domination in conflict* with individual children. Five months' acquaintance had produced no changes in these respects. (*b*) The significant increase in *E* contacts represented expressions of the teacher's initiative and interests, which was offset by a significant reduction in *F* contacts, *working* *with* the child on his own expressed interests and activities. The respective changes in E and F at best indicate that the interests of the teacher and of the children were farther apart in the winter than they were in the fall. (*c*) The D–I ratios remained essentially the same: 2.22 for the fall; 2.11 for the winter. The mental-hygiene quotient, however, showed an unmistakable decrease from 1.13 to 0.62.

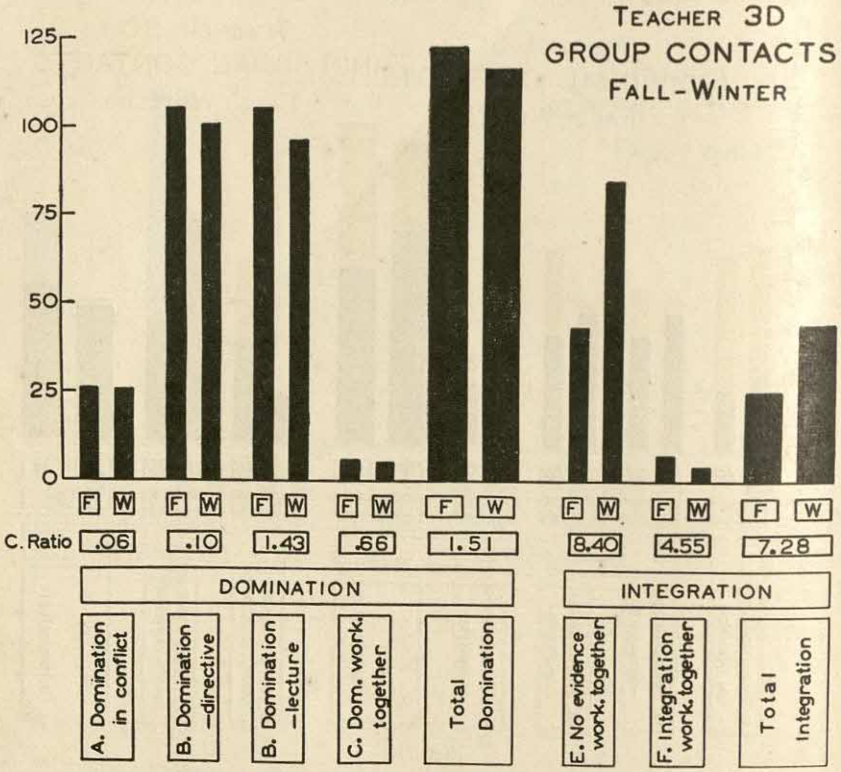

FIG. 8.

The mean frequencies of *child behavior* showed a significant increase in *Social contributions in response* to others, but no change in *Social contributions* that came as a voluntary expression from the child. There was an unreliable decrease in the combined categories of problem solving; no change in total *Responses in recitations;* a significant reduction in *Conforming* and a reduction that was virtually significant in *Nonconforming*. There was no change in *Dominates other children*.

Individual Differences.—By the earlier method of recording teacher contacts as either domination or integration it was shown that from 4 to 5 hr. of observation in a schoolroom yielded data that were highly consistent with data obtained during the next 4 or 5 hr. of observation (9, pages 320–328). That is, differences in teacher contacts with individual children were not due to chance sampling. The measures, therefore, had diagnostic value for studying the relation between individual children and the teacher (9, pages 331–348).

In the later method of classifying teacher contacts according to degrees

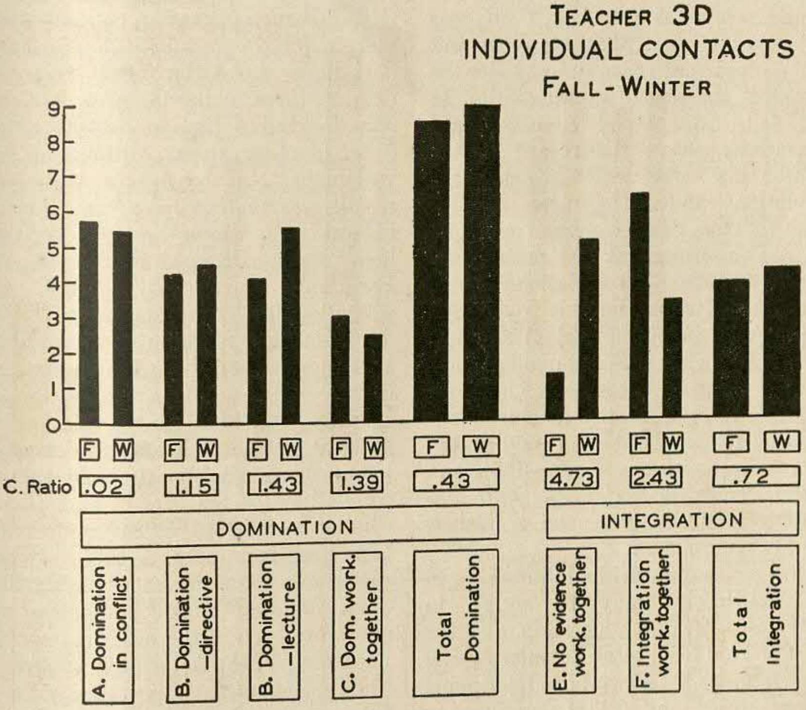

FIG. 9.

of domination and of integration 1 hr. per child of nonconsecutive 5-min. observations has shown a low consistency with the second hour of data. Until the problem of consistency of the sampling is further investigated, it cannot be said that a given sampling per child represents a reliable or consistent sampling or that obtained individual differences were not due at least in part to the inadequacy of the sampling. The problem of consistency of the sampling is being investigated through a sampling of three hours of data per child in the fall for Rooms *C* and *D* reported above and through an intensive study of a smaller number of children in which from 10 to 12 hr. of observation per child have been obtained by practically continuous observation of each child. The analysis of these data is in progress. It would appear that, since consistency of the sampling has been established for the earlier method, the problem of consistency in the use of the *A*, *B*, *C*, *E*, *F* types of contacts is essentially one of methodology in time sampling. The low consistency of the sampling of 2 hr. per child offers a present limitation mainly for diagnostic work with individual children. It is unquestionable, however, that the obtained individual differences reflect more than a low consistency in the time sampling.

In Table 1 above a coefficient of correlation of .71 showed a high relation between the use of *A* contacts with individual children in the fall and again in the winter samplings by Teacher *C*. The coefficient of .71 would seem to indicate a high tendency for those children who were dominated more frequently in the fall to be the same children who had more conflict situations with the teacher in the winter sampling. The scatter diagram of the distribution of children revealed that 15 of the 32 children did not have over one contact of *A*, *Domination in conflict*, in 2 hr. of observation for either fall or winter samplings. One boy, *C3M*, was not only highest in both samplings, but had scores in each case almost twice the scores of the second ranking child. In the fall, *C3M* stood 3.98 standard deviations above the mean; in the winter his score was 3.28 standard deviations above the mean for the group. This one boy was not only largely instrumental in raising the means and standard deviations for the group as a whole, but his frustrating experiences in his individual contacts with the teacher were out of all proportion to those for the group as a whole. Another boy, *C25M*, tied for third place in the fall and was an undisputed second in the winter. His *Domination in conflict* contacts from Teacher *C* also contributed heavily to the coefficient of .71.

Examples of individual differences in child behavior may be shown in categories *M*, *Nonconforming*, and the sum of *J-v*-(1–6), total *Voluntary social contributions*. The two boys mentioned above, *C3M* and *C25M*, produced a reliable coefficient of .45 for *Nonconforming* out of data which without them would have shown essentially a zero relation between the fall and winter samplings.

The same two boys were out ahead again in total *voluntary social contributions*, a group of categories which yielded a coefficient of correlation of .55 between fall and winter samplings. The data for the group, however, would still have represented essentially a zero relation without one girl, *C28F*, whose *volunteered social contributions* in the fall sampling were over twice as frequent as the next highest child and 4.58 standard deviations above the mean. This unusual girl was reported by the observers to have a special awareness of the social amenities. She was imaginative, polite, considerate, and thoroughly charming in her very active social behavior. She had an I.Q. of 125. In the fall she was highest in individual *F* contacts, above average in individual *A*, *Domination in conflict*, contacts, had a score for *Conforming* 1.33 standard deviations above the mean, and was one of three children who had no recorded tallies for *Nonconforming* in 3 hr. of observation. Although *C28F* was highest in the fall in *Voluntary social contributions* she was fourth highest in the winter, her score per two hours having dropped from 41 to 17. For a child who showed so much consideration for "the appropriate," this drop probably represented a considerable dampening of her spontaneity and initiative in social behavior.

Intercorrelations of behavior categories.—For the fall and winter samplings separate tables of coefficients of correlation for teachers *C* and *D*, including a total of 3,024 coefficients, have been computed. A table of such coefficients shows for each teacher and each sampling which categories are related to each of the other categories. For example, the fall sampling offers a confirmation of the importance of the *A* contacts, *Domination in conflict*, and *F* contacts, *Integration in working together*, and a validation of the mental-hygiene quotient which can be derived from the present measures.

For both Teachers *C* and *D* the *F* contacts were positively related to more categories of child behavior than any other grouping of teacher contacts; and the *A* contacts showed positive relationships to the next highest number of categories of child behavior. Consistently for both rooms the teachers' *F* contacts showed reliable and positive coefficients of correlation with *L*-1, *Answers spontaneously* in recitation; *K*-1, *Seeks help;* and *J-v*-(1–6), Total *voluntary social contributions;* all these categories being expressions of the child's spontaneity and initiative; *i.e.*, the more the teacher *worked with* the child in an integrative way the higher his scores in spontaneity and initiative tended to be.

Other coefficients expressed differences in the teachers. For example, for Teacher *C* individual *A* contacts showed a coefficient of .48 with her *F* contacts. This means that Teacher *C* tended to show integrative contacts particularly with those children with whom she most frequently used *A* contacts, *Domination in conflict.* With Teacher *D*, however, whose behavior checked less favorably than that of Teacher *C* against the mental-hygiene assumptions, *A* contacts showed no reliable coefficients of correlation with any other type of teacher contacts, indicating among other things no systematic tendency or special efforts in Teacher *D* herself to *work with* those children whom for one reason or another she most often frustrated.

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CHAPTER XXVIII

THE "SOCIAL CLIMATE" OF CHILDREN'S GROUPS

RONALD LIPPITT AND RALPH K. WHITE

The Aim of the Study

The study herein reported was carried out in two different parts: an exploratory experiment (by Lewin and Lippitt) and a second more extensive research (by Lewin, Lippitt, and White). The primary aim of the first study was to develop techniques for creating and describing the "social atmosphere" of children's clubs and for quantitatively recording the effects of varied social atmospheres upon group life and individual behavior. Chiefly because of practical interests two degrees of adult social control of group life, labeled "democratic" and "authoritarian," were selected as the experimental variables. The second experiment, utilizing in large measure the most fruitful techniques of the first study, had as its primary aims: (*a*) the intensive study of the effects upon individual and group behavior of three variations in social atmosphere, labeled "democratic," "authoritarian," and "laissez-faire"; (*b*) the study of the transition from one atmosphere to another of the same group of children; and (*c*) the relationship between the individual child's home "social climate" and his adjustment to a particular club atmosphere. It should be clear at the outset that these experiments were developed as a contribution to experimental social psychology rather than with any aim of proving the values of one or another kind of educational system or political organization. The actual meaning of the adjectives used to label the experimental social atmospheres ("authoritarian," "democratic," "laissez-faire") is necessarily somewhat different from what the same terms usually mean in political and economic discussions. No confusion will result, however, if the reader lets the terms be operationally defined by the quantitative descriptions which follow of the various behavioral characteristics of the group situations in question.

Some Problems of Methodology

On the whole, social psychologists have tended to be rather unsophisticated as regards the general methodology of science. We have made observational studies and called them "experimental"; we have quantified superficial behavioral symptoms and made rather sweeping generalizations; we have labeled our studies "descriptive" and "exploratory" as rationalizations for having no theoretical framework of thinking from which to draw hypotheses making definite "yes" and "no" research answers possible. The framework of what might be considered a "check list of methodological adequacy" for an experiment in social psychology is presented briefly below, with clear recognition that not all good research in social psychology is experimental. It is suggested that the reader use this "check list" in his critical evaluation of the study here reported. Weaknesses and strengths will stand out in bolder relief.

1. *A good experiment in social psychology (as in any science) should arise from one or more hypotheses* derived from a logical structure of theoretical thinking. These hypotheses should sharply focus the problem, suggesting the kinds of data which would supply a positive or negative answer to the "hunch." Before the present experiment began about 30 "hunches" were made explicit with a listing of the types of data which would be needed; *e.g.*, Hypothesis 21 stated: "The more free from adult social controls the club atmosphere is, the greater will be the predominance of child fact-mindedness and compromise solutions as compared to the proportion of ego-centered status conflict behavior."

2. *A genuine experiment should attempt to isolate the effects of one factor by systematically varying that factor while holding other conditions constant.* For the study to deserve the term "experiment" there must be a systematically planned variation of conditions so that a given effect can be definitely attributed to a particular cause or set of causes. One can find in the literature of sociopsychological research a number of examples of studies which have been reported as "experimental" when the technique has been one of developing a refined observation process in the nursery school or other groups with no attempt to manipulate the situation in any way. *Experimentation* is not synonymous with *observation of selected behavior samples* any more than it is synonymous with *research.*

3. *The good experiment in social psychology should not attempt to copy the superficial characteristics of existing social phenomena* in making experiments from which to generalize any more than the physicist attempts to reproduce the conditions of an apple dropping from a tree at a certain time in a given place in order to understand the forces of gravity and to develop laws from this as the basis of generalizations. In the present experiment no attempt has been made to copy the characteristics of any given "democratic" or "autocratic" social climates, but rather an attempt has been made to vary certain underlying characteristics of all such groupings to learn something concerning the laws of the social processes which crop out with so many varied but related manifestations. A fascinating question of great importance for the future of scientific social psychology is the question of the extent to which questions about total cultures and other large groups not amenable to experimental manipulation can be answered by creating smaller social patterns with approximately the same dynamics but on a scale small enough for experimentation.

4. *In the good experiment the data will be quantitatively adequate* to answer the questions posed by the original hypotheses. This means that not only must recording be reliable and the amount of data large enough, but significant symptoms of behavior and adequately sized units for the description of behavior must be carefully chosen in relation to the particular experimental questions to be answered. It will be noted later in this report, for example, that a meaningful unit of behavior for describing group action may have quite a different time depth and activity range than a unit for describing the behavior of an individual member of the group.

5. *The good experiment,* particularly in social psychology at its present stage, *should be so planned that the experimenter can be constantly receptive to the new concepts and hypotheses which emerge from the rich context of behavior itself.* One of the great difficulties with most of the techniques for recording behavior which have been utilized by social psychologists is that no reanalysis of the data is possible as new "hunches" occur during the course of the study. A few barren check marks or tallies are there on the data sheets. Neither the original chronology of behavior nor new dimensions of it can be reconstructed from the predetermined "irreversible" categories of the check list.

6. *In the good sociopsychological experiment the field of study should be sufficiently broad as to include, as nearly as possible, the totality of factors (and their interdependence) which concomitantly determine a given piece of behavior.* How "deep" a time sample or how inclusive a characterization of the ongoing behavior will be necessary in a particular case depends upon the experimental question which

is being asked. Those who have had occasion to use the time-sampling observation technique, with 5-min. samples, for instance, can realize how rudely such a procedure usually cuts off the observer from analysis of cause-and-effect relationships for most aspects of behavior.

7. And finally, *in the good social experiment, the situations created should be "natural" for the individuals involved,* free from artificially created fears of self-betrayal or loss of approval.

The Technical Methodology of the Present Study

Selection of Groups, Experimental Manipulations, and Controls.—The experimental plan of the second major study of four clubs of five ten-year-old boys each will be described rather than the plan of the simpler preliminary study, which is fully described elsewhere (1).

Before the clubs were organized the schoolroom groups as a whole were studied. Using the sociometric technique developed by Moreno (2) the interpersonal relations of the children, in terms of rejections, friendships, and leadership, were ascertained. Teacher ratings on relevant items of social behavior (*e.g.*, teasing, showing off, obedience, physical energy, etc.) were secured, and observations were made on the playground and in the schoolroom by the investigators. The school records supplied information on intellectual status, physical status, and socioeconomic background. From the larger number of eager volunteers in each class it was then possible to select from each schoolroom two five-member clubs, which were roughly equated on patterns of interpersonal relationships, intellectual, physical, and socioeconomic status and personality characteristics.

Three different degrees or types of leader control of club life constituted the major experimental variable. The tabulation below describes briefly the chief characteristics of these three treatment variations:

Authoritarian	Democratic	Laissez-faire
1. All determination of policy by the leader	1. All policies a matter of group discussion and decision, encouraged and assisted by the leader	1. Complete freedom for group or individual decision, with a minimum of leader participation
2. Techniques and activity steps dictated by the authority, one at a time, so that future steps were always uncertain to a large degree	2. Activity perspective gained during discussion period. General steps to group goal sketched, and, where technical advice was needed, the leader suggested two or more alternative procedures from which choice could be made	2. Various materials supplied by the leader, who made it clear that he would supply information when asked. He took no other part in work discussion
3. The leader usually dictated the particular work task and work companion of each member	3. The members were free to work with whomever they chose, and the division of tasks was left up to the group	3. Complete nonparticipation of the leader
4. The dominator tended to be "personal" in his praise and criticism of the work of each member; remained aloof from active group participation except when demonstrating	4. The leader was "objective" or "fact-minded" in his praise and criticism and tried to be a regular group member in spirit without doing too much of the work	4. Infrequent spontaneous comments on member activities unless questioned and no attempt to appraise or regulate the course of events

Obviously other aspects of the experimental situation besides leader treatment might cause variations in the social atmosphere of the club. It was necessary to make sure that differences in group behavior attributed to different types of leadership were not actually due to other factors. The experimenters, on the basis of the preliminary experiment and their own previous experience, felt that the following factors were potential variables which would have to be experimentally controlled or varied systematically if the results of the study were to be definitive in regard to the variations in leader treatment: (*a*) the type of club activity; (*b*) the physical setting in which the clubs met; (*c*) special characteristics of a particular club personnel (controlled to some extent by selection); (*d*) personality differences of the leaders (as a separate variable from leader treatment); (*e*) sequence of experimental club treatments (democratic treatment coming after an authoritarian experience rather than before it, etc.).

It was possible to equate the *club activities* by arranging it so that the democratic clubs should meet first and decide what their activities would be. The authoritarian leaders could then dictate the same activities to the controlled clubs. In the laissez-faire situation the same materials (plaster of paris, soap for soap carving, model airplanes, etc.) were supplied as in the other situations for use by the boys as they pleased.

The *physical setting* was the same for all clubs. The groups met, two at a time, in adjacent clubrooms which were similar in size and arrangement and which allowed for easy interaction between the groups.

It was possible to ascertain the influence of the variable of *peculiarities of club personnel* by comparing the variation of the behavior of the same group under different treatments (leadership techniques) with the variation of the behavior of different clubs under the same type of treatment.

Several avenues for finding a possible distinction between *leader personality and leader treatment* are open for analysis. Inasmuch as leaders shifted from one type of treatment to another it was possible to find whether the different treatments by one leader tended to be more alike than the same types of treatments by different leaders. It was also possible to find from interviewing the children whether certain of the adults tended to be regarded as good leaders no matter what their leadership technique while other leaders were persistently unpopular. Comparisons of the same leader repeating the same technique with different leaders giving the same treatment also shed some light upon the importance of this variable.

The fifth probable variable mentioned above, *sequence of club experience*, is also amenable to rather systematic analysis in the plan of the present experiment. (For instance, some of the 6-week periods of "autocracy" followed periods of "democracy" and sometimes the opposite sequence occurred.)

The observation techniques were broad enough in scope to throw into bold relief other unplanned-for variables which might affect in an appreciable way the experimental results.

Observation Techniques and Other Records.—Just as mechanical recording instruments in the physics laboratory may be roughly or highly calibrated, so the human organism as a recording instrument may reflect the behavior of others with refined accuracy or only with rough approximations. It is probably correct to say that the more interpretive and meaningful the units of behavior are which are being recorded the more highly trained or "sensitized" must be the observer to get reliable records. In the present experiment, which called for the grouping of diverse behavioral symptoms having the same psychological meaning into one category, it was important that observers have preliminary training as well as be trained students of child behavior. The University of Iowa preschools were used for this training purpose until our human instruments had become sufficiently refined to record the behaviors called for by our observation categories.

Eight types of club records were kept. The four most important were as follows; at least one observer specialized in each type.

1. A quantitative running account of the *social interactions* of the five children and the leader, in terms of symbols for directive, compliant, and objective (fact-minded) approaches and responses, including a category of purposeful refusal to respond to a social approach.
2. A minute-by-minute *group-structure* analysis giving a record of activity subgroupings, the activity goal of each subgroup, whether the goal was initiated by the leader or spontaneously formed by the children, and rating on degree of unity of each subgrouping.
3. An *interpretive* running account of strikingly significant member actions and changes in the atmosphere of the group as a whole. This was the basis of the most significant interaction data—difficult to quantify but extremely suggestive as to the underlying dynamic factors involved.
4. Continuous *stenographic records* of all conversation. This was the basis of the most significant data.

These data were synchronized at minute intervals so that placed side by side they furnished a rather complete and integrated picture of the ongoing life of the group.

It might appear that with five observers available to observe a club of five children the strategic procedure technically would be to assign one observer to each child. Experience has indicated that such a focusing of observational attention upon "individual biographies" results in an unintegrated picture because important aspects of group life as a whole cannot be reconstructed from such "atomistic" records. When our observers, on the other hand, record such facets of total group life as group structure and certain types of social interactions between all members, it is quite possible to analyze the behavior of individual members within the context of the total group field.

Five other types of data covering the lives of the club members were collected, the three most important of which were:

1. Interviews with each child by a friendly "nonclub" person during each transition period (from one kind of group atmosphere and leader to another) and at the end of the experiment, concerning such items as comparison of present club leaders with previous ones, with the teacher, and with parents; opinions on club activities; how the club could be run better; who were the best and poorest club members; what an ideal club leader would be like, etc.
2. Interviews with the parents by the investigators, concentrating on kinds of discipline used in the home, status of the child in the family group, personality ratings on the same scales used by the teachers, discussion of the child's attitude toward the club, school, and other group activities.
3. Talks with the teachers concerning the transfer to the schoolroom of behavior patterns acquired in the club and vice versa.

These data were collected with a view to correlating the individual patterns of behavior in the club situation with the types of group membership which existed outside the experimental situation and with the more or less stable individual personality structures.

The introduction of observers into such a club situation without affecting the naturalness of behavior is itself an interesting research problem. In the first experiment it was found that four observers grouped around a table in a physically separated part of the clubroom attracted virtually no attention if it was explained to the boys at the first meeting that "those are some people interested in learning how a mask-making club goes; they have plenty to do so they won't bother us and we won't bother them." In the second experiment the physical arrangement was even more advantageous and seemed to make for equally unself-conscious behavior on the part of the clubs. From the drift of the group conversations while the leaders were out of the room it was clear to even the most skeptical guest observers that, as a rule, they "hardly existed at all" so far as the behavior of the children was concerned.

Reliability, Validity, and Categorization of Data.—The validity of social-behavior records, the extent to which they actually conform to the realities of the behavior they represent, can be judged only by agreement with other attempts to measure the same variables, or by the fruits, in terms of correct predictions and hypotheses which result from the use of the measurements. The authors believe that a more valid picture of social-behavior data is possible with this present field-theoretical approach to behavior measurement than is possible with some of the other more widespread child-behavior recording techniques.

It is possible to consider three different types of reliability: (*a*) agreement between the records of two observers making simultaneous observations of the same phenomena; (*b*) agreement between categorizers of behavior from the same behavior record (the same person twice or two different persons); (*c*) adequacy of the behavior sample as a reliable (stable) representation of the total behavior range concerning which the researcher wishes to generalize.

With 11 trained observers required to carry on the regular observations in the present experiment it was found impossible to get additional trained volunteers to work out simultaneous observer reliabilities with each one. It was possible to make preliminary checks and indirect estimates. Simultaneous observations by two group-structure analysts yielded an index of agreement on subgroupings of 85 per cent, which would have been higher if degrees of disagreement rather than an all-or-none method of computing agreement had been used. From the preliminary training of stenographic recorders the index of agreement for conversation records ranged from .78 to .95 with an average reliability of .84. Checks of the other techniques indicate the same range of observer agreement.

The second phase of the reliability computations is the agreement between separate tabulation analyses of the same stenographic and running account records. Two problems face the analyst of behavior records: (*a*) how much behavior shall be called a unit of behavior; (*b*) into which of the selected categories this unit of behavior should be placed. The categories for the analysis of conversation and the group diary records (running accounts) in the present study were determined by *the kinds of data which were needed to test the hypotheses formulated at the beginning of the study.* For the conversation analysis 110 different kinds of behavior items were finally boiled down into 23 main "behavior clusters," of which the following are examples: Leader behavior—(1) "Orders"; (2) Orders which disrupt ongoing child activity; (5) Extending relevant knowledge; (6) Stimulating self-direction; (8) Constructive criticism. Child behavior—(1) Expressions of discontent with leader and situation; (3) Demands for attention; (6) "We-minded" remarks; (12) Work-minded direction of the behavior of others. The investigators independently coded the conversation records into the 23 categories with a per cent of agreement of .86 for the 3,000 units of conversation involved in this reliability analysis. It was found that in less than 1 per cent (.007) of the total items categorized did the analysts disagree on what constituted a unit of behavior.

In reading the group diary records it was found that certain major shifts of group atmosphere stood out which would make it profitable to break down our data into "group life units." Thirteen different types of group units were finally delineated, of which the following are examples: 1) getting oriented; 2) discussing; 4) involved work; 5) distracted work; 7) organized play; 8) disorganized play. Independent analysis by the two investigators resulted in indexes of agreement ranging from .90 to .98; for agreement on the number of units per meeting (.91), the exact length of each of the units (.90), and the category in which the group life unit belonged (.98).

The third type of reliability, the problem of an adequate sampling of behavior, need not concern us greatly in this study, since the total amount of information was so great and since different types of data can be used as checks upon each other.

Illustrative Club Meetings

In order to give a concrete picture of the sort of data represented in this experiment, excerpts from the records of four different club meetings will be presented. Four types of club meetings rather than three are mentioned here and illustrated because as the study progressed it was discovered that the same pattern of authoritarian adult leadership resulted in two different types of group reactions in different clubs: (1) an aggressive, irritable, self-centered reaction in some clubs, and (2) a submissive, highly dependent, socially apathetic reaction in other clubs. These meetings have been selected as fairly representative of the four main "atmospheres": the submissive reaction to autocracy; the aggressive reaction to autocracy; democracy; and *laissez faire*. In each case, some interpretive comments are added in a parallel column.

AN EXAMPLE OF THE SUBMISSIVE REACTION TO AUTOCRACY

Excerpts from Club Records	*Interpretive Comments*
The group comes in before the leader arrives. In his absence, they show little interest in their work. They kid the other group about being in the movies. The other group is the second club meeting in the adjacent club space. As mentioned previously, in all cases two clubs met simultaneously in adjoining clubrooms so that interaction between groups under different types of leadership could be studied. Ray says, "You ought to have Martha Raye and stick your head in." Ray looks into the box. The others sit around the mask they have been working on, paying no attention to it.	Work is slack when leader is out. *Work motivation is induced by the leader; not spontaneous.*
The leader (W.) enters the room, walking rapidly. He begins immediately to direct their work: "The first thing we're going to do is to make footprints in the plaster of Paris mold. Get your aprons on . . . . Vinnie, help Ben . . . . Now we need some plaster. That should be about two-thirds full . . . ."	No discussion or cooperative planning; only orders from above. The leader gives only a bare minimum of "time perspective." The boys get little sense of *why* he gives his specific orders. This is probably a major factor in their lack of interest in the project as a whole.

The boys put on their aprons as directed and begin work. Ben asks, "Me? Okay." He asks for approval of the detailed steps in his work: "Is that high enough, Mr. W.?" W. answers: "It should be deeper."	The free, sociable, joking atmosphere disappears almost completely as hard work begins.
They are all working steadily now under W.'s direction. Beaumont now seems to be the only one who is not really "in" the situation.	Efficiency is fairly high so long as the autocratic leader keeps everyone busy.
W. says, "Ray, you put your footprint in this while Beaumont keeps on stirring. And Vinnie, you put the sand up close around his foot; pack it down tight. Make a good print. . . . All right, take your foot out."	
. . . .	
Ray asks, "How's this, Mr. W.? Do you think that will have to take a little bit more?" W. answers, "A good deal more. Put some more plaster of Paris in." Ray: "Now is she getting thicker?" W.: "More yet . . . . That's right. That's plenty."	The boys are dependent upon the leader for detailed work directions. Having no time perspective or organized ideas in terms of which to evaluate their own work, they are forced to rely upon him.
. . . .	
(The same uneventful pattern of behavior continues until, after more than half an hour, the leader goes out of the room.)	
Within 1 min. after the leader goes out, all the boys have stopped working, Ray and Ben begin talking freely to each other; the others just sit.	The lack of spontaneous interest in the work shows itself again as soon as the leader goes out.
. . . .	
After 5 min., wisecracks begin going back and forth between this group and the other group. Ray takes the lead; he yells, "Baby Reilly, playing in the sand . . . ."	
Reilly, in the other group, throws over at this group a small plaster of Paris "marble." Ray shouts, "Give it to him," and throws it back. Ben backs him up, "Go ahead, give it to him now . . . . Stand back over there, you twirp." Observer writes, "Here goes the war."	Are they "discharging tension" which was bottled up during their submission to an autocratic regime?
The war relaxes, however, and becomes mainly verbal. Leonard, from the other group (which has been showing the aggressive reaction to autocracy), is making sallies into this group's territory. Ray says, "Hey, Leonard, what's your hurry? . . . Listen, you. Hey, rat—that backbone of yours looks like a snake."	Under the autocrat, Ray's colorful personality was indistinguishable from that of the others. In a freer atmosphere, his individuality shows itself immediately.

Ben backs him up again: "What'd you leave for? You cross-eyed rat!"

……

(Hostilities remain on this verbal level until the leader returns. The group then returns immediately to the same dull but industrious and efficient pattern of behavior which they showed before he went out.)

AN EXAMPLE OF THE AGGRESSIVE REACTION TO AUTOCRACY

Excerpts from Records

Immediately after coming in, the boys discover some slight damage done to their work by the "Monday gang." Sam is the loudest in voicing his resentment: "Look around and see if they got anything we could bust up. We'll get them for that this time."

M. (the autocratic leader) heads off an attack on the "Monday gang's" property by very firmly outlining the day's work: "Today we've got to paint and letter the sign." Sam interrupts, "I'm doing the painting." M. continues, "Before we start there's something we have to do. That's to make work aprons." Sam interrupts again, "Where's the apron that was in here?" M. goes on, "You each make an apron and paint your name on it. Start before you mix any of the other paint." Leonard demands, "I get some of this burlap." Sam warns the others, "Don't make the red paint, Reilly . . . . And don't mess with my red paint, guys."

Fred, Leonard, and Sam get under way. Reilly protests and says he'll make up the paint first. M. says, "No, the apron first."

……

By the eighth minute the group has quieted down and is hard at work. Observer writes, "This is a picture of individual industry I've not seen presented by this group before. Some of the horsiness has gone out of them since their arrival, but I'm afraid it's not permanent."

……

In the fourteenth minute the other group come in and are greeted by derisive remarks. Leonard says, "I thought I heard those dopes coming up." Reilly says, "Here come the skunks. I thought I

Interpretive Comments

Although most of the restrictions come from their autocratic leader, most of the boys' aggression and competitive self-assertion is directed against "scapegoats": the "Monday gang," the other club which meets on the same day, or other members of the same club.

smelled something." Sam says, "Give us a gas mask. Here comes the other gang."	
. . . .	
M. asks who left the scissors on the floor. Fred says Lyman worked with them last. Lyman says he gave them to Leonard. Leonard denies it, "No, you didn't." Lyman flushes with anger but says nothing except, "I did, too." Observer writes, "I've never seen an outfit any busier in pointing out each others' faults."	With continued restrictions (which are not accepted with resignation, as in the "submissive reaction"), the boys become tense and irritable.
. . . .	
Fred is definitely sullen, and responds to M. (the autocratic leader) by muttering under his breath . . . . He is getting madder and madder and is kicking things about. He kicks the stool under the sign . . . . Everybody is yelling at once and getting rather cross, but Fred is the most objectionable	Direct rebellious aggression against the autocrat is partly suppressed, and the footstool becomes an inanimate scapegoat.

An Example of Laissez Faire

Excerpts from Records	*Interpretive Comments*
The boys come in and immediately cluster around a blueprint on the table. Their adult leader, A., stands apart from the group, leaning against a post. The group pays no attention to him.	
Van says, "Come on, let's make plans, boys." Bill (who was elected "captain" at the last meeting) answers, "We're going to draw something. I don't know just what we'll do . . . . We want to draw a ship, see? Let's draw plans of a gun or a building or something."	The boys are all in an unstructured field, and all of them except Finn have a need to structure their field more clearly.
Finn mocks Bill: "You don't seem to know much." Bill replies, "Well, what do *you* suggest?" Finn only makes a wisecrack and starts out on some little wood project of his own. Eddie (in sympathy with Bill) urges, "We gotta have some plans to work on." Bill goes on, "Let's make a map or something. Any suggestions? . . . This is the crooks' hideout and we've got to plan ways to get in . . . . We have to cover it from these sides now. There are electrical wires on the bushes." All of them are intent on the plans except Finn, who is very restless. He lies down on the table.	The group is making a real effort to get together on something constructive, and for the time being they are successful.
(The discussion continues on a very constructive level for about 12 min.) Finn feels out of it. He makes a smarty gesture with his stool, saying, "Here's *my* idea." Bill hasn't given him any recognition.	

Suddenly the table on which they have been leaning breaks down. Finn is utterly delighted. The others seem dismayed, but start out, somewhat haphazardly, to fix the table.

……

(After 3 min. the prospect of fixing the table seems hopeless, and the group disintegrates almost completely. They do not really get together again during this meeting, nor, for that matter, throughout the remaining five meetings of laissez-faire leadership. Of course the adult leader, A., does nothing to promote reorganization.)

……

Finn is now very smarty, but gets no response. Eddie paints dots on Bill's pants. Finn says, "Oh, gee, I guess I'll make this thing polkadottie."

……

Eddie shows his restlessness by throwing darts. They begin to talk about generals, just as they did last time when things became anarchic.

They are now at the high point of disorganization so far today. Bill has suggested "doing something" but there is no plan yet.

Eddie is whittling, Van painting, Hamil hammering, Bill playing shotgun with a board. Finn tries to grab it from him.

Eddie and Finn start a play fight for the wooden gun, which lasts about ½ min. . . . .

(After half an hour of restlessness, boredom, and rising tension, the play becomes more active.)

There is a noise from behind the burlap —yipping like a dog. Finn and Hamil are making and painting guns. . . . .

Machine-gun game behind burlap. Much burring of guns. Finn points gun at Dave (in other club) and says, "We're going to have a war . . . . We want a war." . . .

Much noise of guns. Most of the other club (with democratic leadership) pay no attention. Eddie yells, "They retreat!" Bill is sitting pensively on a stool and looking at the other club as if envious of their cohesion and efficiency. Eddie yells, "Give 'em the first degree." . . .

Finn, who feels left out, has been feeling more and more hostile to the group.

There is "nothing to do," except horseplay.

Three major factors which make for aggressive behavior are now present: (*a*) absence of a respected adult; (*b*) idleness; and (*c*) frustration, leading to a high level of psychological tension.

Finn, who is not at all "adult-value-centered," is now in his element.

But Bill, who is highly adult-value-centered and hates confusion, is miserable.

AN EXAMPLE OF DEMOCRACY

(Same group as in example of *laissez faire*)

Excerpts from Records	*Interpretive Comments*
Van and Finn come in together. Van finds a bar of soap and says, "Look, here's the soap for the soap carving we decided on."	"We" decided—not "I" and not "our leader."
Bill and Eddie come in, and Bill says enthusiastically, "That's a good kind of soap!"	Interest in work is keen, even before leader enters.
. . . .	
Finn asks the leader, "What's this for?" The leader, W., answers, "That's an orangewood stick, and the flat end is for smoothing down this way." Finn, "Well, what about this flat end? Oh, I'll bet that's to make grooves."	Finn is thinking for himself and thoroughly interested. Note the contrast between this and his behavior in laissez faire.
. . . .	
Bill holds up his piece with a laugh, "Look, Mr. W., I might make a bed out of this." Finn admires it, "Well, nice going, Bill." . . . Bill later returns the compliment, "Oh, that's good, Finn. That's a good idea. Mine's too weak."	Pleasure in successful work project promotes friendliness; friendliness results in mutual praise; and praise, in turn, promotes pleasure in work.
. . . .	
Eddie, Bill, and Finn are busy on their projects, but Van is still casting around for the kind of boat he wants to carve; he is looking at pictures in the book. W. looks with him. W. exclaims, "Oh, boy, look at this model of a racing shell!" Van says doubtfully, "I was thinking of a canoe." W. agrees, "I think a canoe is probably the best idea. . . . Can you see there how almost straight it is for a long distance in the middle?"	Status can be gained by good work; there is no need to get it by aggressive horseplay. The leader tries to follow up the boys' own ideas, and, by giving necessary information, helps to make them more effective.
. . . .	
W. remarks that if they're going to have the crime they planned last time, it's about time to begin. Van says, "I'd like to finish my carving." W. asks the group, "Shall we finish this work and have the crime next time? How many think so?" Bill, "That's okay with me." The others also agree.	Vote shows high interest in present project.
Van: "Well, I guess I'm not even voted against." W.: "Yes, it's unanimous." Finn: "What does that mean?" Van: "It means not voted against. (Turning to W.) Doesn't it?" W. nods. Bill: "We ought to learn those rules about voting and have things regular."	Leader attempts to develop both the skills and the vocabulary of democracy.

. . . .

Van (who is probably the most insecure member of the group and also the most childlike) holds up his motorboat for everyone to see, but no one seems to notice him. He takes it to the pail of water and pushes it around the surface making a motor noise. Still no one looks at him, until W. turns and comes over to join him and comments on the "good motor." Van seems satisfied and settles down to quiet work again immediately.

. . . .

After a full hour, Bill says to the group, "Let's get ready to go home." He begins to pick up.

W. (picking up a broom), "We don't have much cleaning up today."

Finn (picking up a large chunk of soap from the floor): "Here's something we might want."

W. sweeps and Van holds a paper for him to sweep into.

In this atmosphere, each boy feels more free to "be himself," and individuality of behavior is consequently more marked than in the apathetic reaction to autocracy.

The leader tries to respect individual differences and gives interested attention to those who seem to need it most.

In *laissez faire,* no one cleaned up except Bill. Now everyone seems to join in naturally. "Group goals" are accepted and taken over by each individual.

Leader Behavior

The planned differences in leader behavior have been indicated on page 487. We shall confine ourselves here to some illustrations of the data on how the leaders actually behaved and how homogeneous the actions were of leaders delegated to behave in the same manner.

Figure 1 presents a comparison of the behavior of the average authoritarian, democratic, and laissez-faire leaders in terms of incidents of behavior in an equated unit of time (6 club meetings of 50 min. each). The reader will note that the first three categories, "leader orders," "disrupting commands," and "non-constructive criticism," may be thought of as representing leader behavior which has a limiting effect upon the scope and spontaneity of child activity. About 60 per cent of all the behavior of the average authoritarian leader was of this sort, as compared to 5 per cent for the democratic and laissez-faire leaders. The authoritarian leader usually initiated a child's activity with an order; often disrupted the ongoing activity by an order which started the child off in a new direction not spontaneously chosen; and sometimes criticized club work in a personal manner which carried the meaning, "It's a bad job because I say it's a bad job" rather than "It's a poor job because those nails are bent over instead of driven in" (objective criterion). These are statistically significant differences and conform with the planned leader behavior patterns.*

The next three categories may be thought of as representing leader behaviors that extend a child's freedom and mastery of his environment. In "guiding suggestions" the authoritarian and laissez-faire leaders were both significantly lower than the democratic leaders, which is again in line with the planned behavior.

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* Throughout this study statistical significance has been computed on the basis of the small sample theory developed by Fisher. The "level of confidence" of a given t is represented as a per cent and indicates the degree of certainty with which the hypothesis that the two groups being compared come from the *same* population may be rejected. A t at the 1 per cent level indicates that the difference obtained between groups could occur by chance only one time in a hundred. All t's up to the 5 per cent level have been called significant in this study.

The category "praise and approval" indicates the functioning of the adult as a dispenser of social recognition. This was a function of the authoritarian leader significantly more often than the democratic leader, in whose club situation recognition flowed from all members rather than just the leader.

The "jovial, confident" items of behavior are a good index of the extent to which the leaders got "on the same level" as the boys and established friendly personal relationships with them. The democratic leaders exhibited eight times as much of such behavior as the authoritarian and laissez-faire leaders.

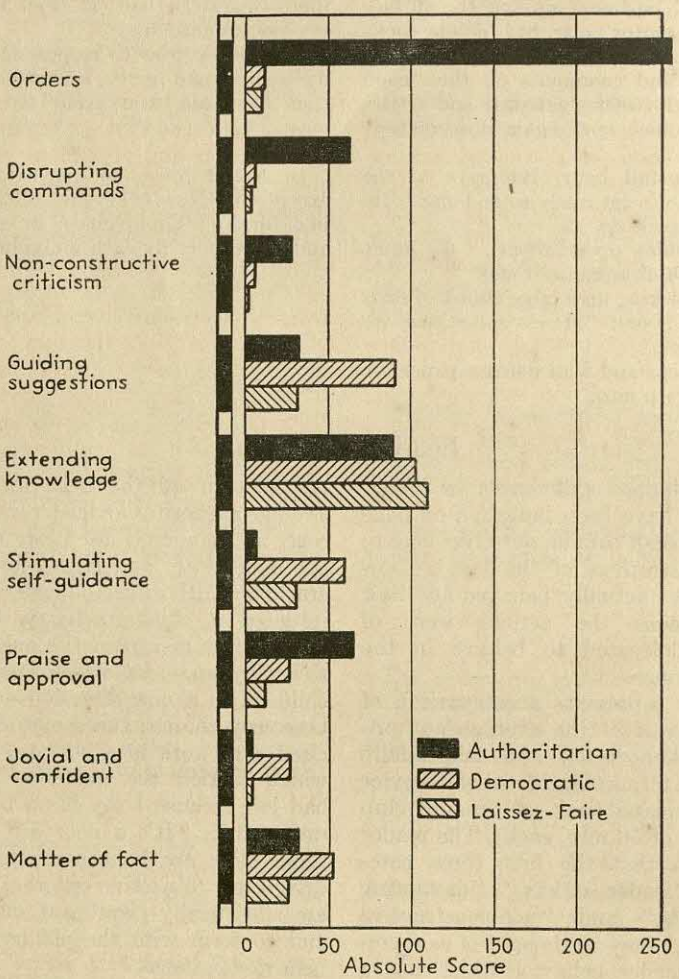

FIG. 1.—Comparison of behavior of average authoritarian, democratic and laissez-faire leader.

An important difference in leader policy is indicated by the fact that in five democratic clubs there were 234 min. of group discussion as compared to a total of 3 min. in the same number (30) of meetings of five clubs under authoritarian leadership.

A very simple method of comparison indicates the success with which all the leaders delegated to assume a given leadership role behaved in a homogeneous fashion. On all the comparisons mentioned above which have differentiated the average leader of one social atmosphere from the average leader of another, there is no overlapping of atmospheres in the rank orders when the behavior of all the leaders (five authoritarian, five democratic, two laissez-faire) are arranged in order for any of the significant categories. Analysis of the total pattern of behavior also reveals that three clearly different leadership patterns were created with a much smaller range of individual differences in leader behavior within the pattern than between patterns.

Owing to the systematic shifting of the individual leaders and also of their leadership techniques it has been possible to find evidence to indicate that it was the leadership technique rather than any other personality characteristics of the adult leaders which brought about the club and boy reactions which are discussed in the following sections.

Group Morale: Cohesive and Disruptive Forces

The Level of Morale in Autocracy, Democracy, and Laissez Faire.—In the limited space available, we can give only a sample of the actual results of the experiment. The sample which we have chosen includes data on two specific problems: group morale and the determination of group goals.

In the following discussion, the somewhat vague term, "morale," will be used with a single and relatively definite meaning: it will mean *spontaneous cohesion* in a group. "Cohesion" here means "hanging together" in every respect—working together for common goals, thinking in terms of "we" rather than "I," showing friendliness rather than hostility toward other group members, etc. "Spontaneous" here means that the cohesion is a result of attitudes which the group feels to be its own rather than induced by the leader and dependent upon his continued physical or psychological presence in the group.

If this definition is adopted, it can be said without hesitation that morale was decidedly higher in our democratic groups than in our laissez-faire groups or in either type of reaction to autocracy. There are several types of quantitative data which point in this direction. There is, for instance, the simple ratio of the number of times that the boys used the pronoun "we," in the stenographic records of their conversation, compared with the number of times they used the pronoun "I."

WE-I RATIO

	We/I
Democracy	.39
Laissez faire	.38
Autocracy (aggressive reaction)	.36
Autocracy (submissive reaction)	.29

In this tabulation it will be noted that the most marked difference is between the submissive reaction to autocracy, which has the lowest amount of "we-mindedness," and the other three atmospheres. This is primarily due to the type of individual dependence upon the leader which characterized the boy-adult relationship in these submissive groups: "What should I do next?", "Did I do this all right?", etc.

The morale of the democratic groups was strikingly superior in another respect, the number of friendly remarks made by the average group member to other group members in a 1-hr. meeting.

FRIENDLY REMARKS

Democracy	26.1
Autocracy (aggressive reaction)	21.7
Laissez faire	20.6
Autocracy (submissive reaction)	17.1

The difference is still more clear-cut in the number of remarks to other group members or to the leader expressing discontent with the club situation.

Some other quantitative indexes are represented in the following table (all in terms of the behavior of an average boy member).

DISCONTENT OF AVERAGE MEMBER

	Expressed to leader	Expressed to members	Total expressions of discontent
Democracy	0.8	0.8	1.6
Laissez faire	1.5	3.1	4.6
Autocracy (submissive reaction)	2.0	2.1	4.1
Autocracy (aggressive reaction)	11.1	4.4	15.5

	Frequency of behavior per 1 hour of meeting		
	Friendly remarks to leader	Group-minded remarks to leader	Purposeful ignoring leader's remarks
Autocracy (aggressive reaction)	1.8	3.4	2.5
Autocracy (submissive reaction)	2.9	2.2	2.2
Democracy	6.7	7.3	0.6
Laissez faire	3.6	3.1	3.1

	Aggressive to members	Asking attention from members	Group-minded remarks to members
Autocracy (aggressive reaction)	44.7	14.5	6.7
Autocracy (submissive reaction)	8.1	3.6	4.2
Democracy	36.8	18.1	18.3
Laissez faire	38.5	18.6	28.6

	Per cent of total time			
	Organized play	Disorganized play	Intensive work	Loafing
Autocracy (aggressive)	3.0	0.0	52	0.6
Autocracy (submissive)	0.9	0.0	74	0.2
Democracy	8.0	1.6	50	0.2
Laissez faire	6.6	18.0	33	4.8

A careful examination of these figures will bring out certain qualitative differences (already indicated in general fashion by the club records) between the various atmospheres, and, in addition, from the total picture the higher degree of "*spontaneous* cohesion" in the democratic groups may be discerned. For example, the amount of time devoted to intensive work (which may be taken as one index of "working together toward common goals") is distinctly higher in the submissive reaction to autocracy (74 per cent) than in democracy (50 per cent), but, particularly in view of the behavior when the leader is out of the room, this cannot possibly be looked upon as "spontaneous" cohesion. On the other hand, the difference between democracy and *laissez faire* in this respect (50 *vs.* 33 per cent) may be looked upon as a true index of the difference between them.

Some Reasons for Group Disruption in Autocracy.—Looking behind these data and trying to find the psychological factors which accounted for them, we must ask two major questions: (*a*) Why was morale usually higher in democracy than in autocracy? (*b*) Why was morale usually higher in democracy than in *laissez faire*, which was, at least superficially, at the opposite extreme from autocracy?

On the basis of our quantitative and qualitative records, three factors emerge as probably most important in answering our first question; *i.e.*, in accounting for the comparatively low morale associated with both types of reaction to autocracy:

1. Restricted space of free movement (with resultant frustration of the need for autonomy—if this need is not "given up"—and a generalized dissatisfaction with the total situation).
2. Frustration of the need for sociability.
3. Opposition to (or at least a psychological detachment from) the leader and his goals.

It is obvious that any type of autocracy which did not produce these particular effects might coincide with a very high morale. (In the present-day German army, for instance, it is at least conceivable that there may be a high degree of "identification" with, rather than detachment from, the "Leader" and his goals.) The fact remains, however, that in our own culture, and on the ten-year age level, our particular sort of autocracy did seem to have these effects.

1. The first factor, "restricted space of free movement," is quantitatively represented in our data by the large proportion of restrictive behavior by the leader (*e.g.*, 256 "orders" in autocracy in 6 meetings as contrasted with 11 in democracy, and 63 "commands disrupting boys' previous activity" as contrasted with 4 in democracy). It is represented also by the high proportion of dependent reactions to the leader in the conversation analysis (13.7 and 15.8 in the two reactions to autocracy, as contrasted with 5.8 in democracy). It is best represented, however, by the boys' own statements, in the interviews, about their own feelings toward their autocratic leaders: "He was too strict," "He didn't let us do what we wanted to do," "He made us make masks, and the boys didn't like that," etc.

There were several indications that this frustration was reduced to a minimum in some of the autocratic atmospheres in which the submissive reaction was shown. In at least two of these groups, the boys apparently "gave up," to a large extent, their normal wish for autonomy, independence, or self-determination, and to that extent they ceased to be frustrated by the autocratic restrictions. This giving-up process seems to have been facilitated by the fact that in these cases the leader was viewed as work-minded, rather than arbitrary and personal, in the restrictions he imposed. To give in to a master workman, who was intent upon getting an important job done well, was apparently not a great blow to the boys' pride and was more easily accepted by them. Frustration reached a high point when the boys felt that their leader imposed arbitrary demands upon them which were not required by the objective character of the job that had to be done.

2. A quite unexpected result of autocratic leadership, in our experiments, was the extent to which it apparently inhibited normal free-and-easy sociability between the boys. In the four examples of "submissive reaction" this nonsociability was particularly striking. It was illustrated, for example, by the low total volume of child-to-child conversation (126 conversation units per six 50-min. meetings as contrasted with 220 in democracy), and by the small proportion of "out-of-club-field" conversation; *i.e.*, outside of the range of topics directly related to club activities (4.6 conversation units as contrasted with 13.6 in democracy). Whatever the psychological reasons for it may have been, the fact was obvious that the repressive influence of the autocrat was carried over or generalized, somehow, so as to inhibit types of sociability which he never overtly prohibited in any way.

In the case of both of the above factors the inference from our data would be that the dissatisfaction with one aspect of the total situation (*e.g.*, lack of independence or lack of sociability) has spread to the situation as a whole. Because the boys were dissatisfied with one aspect of the club situation, they tended to become dissatisfied with all of it, *including the group itself and the work on which it was engaged.* This is, at least, one way in which we can logically link the data on specific frustrations with the data on lowered group morale.

3. The third factor is psychologically quite different. Instead of involving a spreading of dissatisfaction from a part of the situation to the situation as a whole, it involved a dividing of a boy's psychological field into two sharply opposed portions; the portion which belongs to the adult leader and the portion which belongs to the boy himself (or, in some cases, to the boys considered collectively, in opposition to their leader). Through this sharp dichotomizing of the field, there results a lack of relationship, or even an inverse relationship, between what is perceived in one portion of the field and what is perceived in the other. Specifically, the leader's goals, as perceived by the boy, are not automatically taken over by him (as they often are in democracy, where the boys "identify" with their leader), but are ignored or actively rebelled against. It is "what *he* wants me to do and what *I* want to do"—with the implication that the two things are necessarily different or even opposite—rather than simply "what we all want to do." It is understandable that any sharp cognitive differentiation between leader and followers—any stressing of the differences between them—would tend to provide a basis for this sort of psychological response. The evidence on this factor is largely circumstantial, but it is fairly convincing. It consists partly of the data showing how sharply differentiated the behavior of leader and followers were in autocracy (*e.g.*, the ratio of leader's ascendant behavior to boy's ascendant behavior was 11.3 in the submissive reaction to autocracy and only 0.8 in democracy). It consists partly, also, of the boys' own verbalized feelings about their leader; *e.g.*, the boy who said his democratic leader "worked right along with us, and thinks of things just like we do."

Some Reasons for Group Disruption in Laissez Faire.—There seemed to be three factors, again, which were primarily responsible for the low group morale in *laissez faire:*

1. Restricted space of free movement (restricted by ignorance and mutual interference and resulting in

frustration of the need for worth-while cooperative achievement).

2. Frustration of the need for clearness of structure.

3. The vicious circle of frustration-aggression-frustration.

1. There is much evidence indicating that the boys in the laissez-faire situation became dissatisfied with their own lack of efficiency and of solid accomplishment. They wanted to accomplish things, and they wanted the satisfaction of accomplishing them cooperatively as a harmonious working group. Both needs—the workmanlike need and the social need—were frustrated in *laissez faire*. This was shown, for instance, by the high frequency of proposals for united action: "We gotta have some plans to work on," "Let's make a map or something," "Let's draw plans of a gun or a building or something"—proposals which usually remained abortive because of incapacity to cooperate in carrying them out. Such proposals account for the surprisingly high proportion of group-minded conversation and the surprisingly high We-I ratio (see tabulation page 499) in the highly individualistic laissez-faire groups. The frustrated needs were apparent also in the boys' evaluation of their laissez-faire leaders: "He was too easygoing," "He had too few things for us to do," etc.

2. There was evidence that at least a majority of the boys had a need for "clearness of structure" in their psychological environment. There was a tendency to be dissatisfied by chaos, confusion, uncertainty. This was shown both by many of their remarks during the meetings (*e.g.*, the attempt to set up a military type of organization when things became too anarchic) and by remarks in the interviews (*e.g.*, "He let us figure things out too much," while the autocrat "told us what to do, and we had something to do all the time").

3. In the running accounts of the laissez-faire meetings there was evident a vicious circle involving frustration which led to aggression and aggression which led, in turn, to mutual frustration. Both the psychological tension which resulted from frustration and the idleness which resulted from the absence of any organized constructive group activity, were apparently conducive to a large amount of more or less good-natured bickering and competitive horseplay. This aggression, then, tended to "frustrate" the persons who were attacked, especially if these persons were sincerely attempting to start some constructive work. Thus, the work-minded boys who wanted to exercise their "freedom" to do constructive work found it almost impossible to do so. Mutual interference proved to be a highly effective disrupting force.

Group and Individual Goals and Group Achievement

In the preceding section, where cohesive and disruptive forces in the experimental clubs were briefly examined, it was suggested that one of the bases of high group morale was the spontaneous working together for a common group goal by the club members. In this section attention will be focused upon how this "common group goal," especially in the democratic groups, was determined and maintained.

Goal Setting in the Three Social Climates.—One factor in the establishment of group goals, which was brought out in the excerpts given above and in the statistics on leader behavior, was that the democratic leader *took into account the boy's own goals*. He harnessed the energy of their individual purposes in creating a group purpose which developed out of them. A second difference in the policy formation process of the groups was the *encouragement of free discussion* in the democratic atmosphere (14 per cent of club time) as contrasted to an almost complete inhibiting of discussion in the authoritarian clubs (0.2 per cent). Although 10 per cent of the time in the laissez-faire groups was spent in decision-seeking discussions, the lack of leader stimulation of self-direction by helping to take a consensus and to bring a satisfactory ending to discussions resulted chiefly in "decision frustrations." The average democratic leader stimulated group self-direction 60 times in 6 meetings as compared to 30 by the laissez-faire leaders and 7 by the average autocratic adult. A third difference is that the democratic leaders *helped the group gain a "time perspective,"* an over-all picture of the various steps needed to attain the group goal. As the group worked along from day to day they would be able to "feel progress" because the leader had helped them set up mental signposts along the path to the goal. In order to maintain a firm grasp upon the direction of group effort in the authoritarian clubs the leaders left a large cognitively unstructured gap between the future goal and the present step. Immediate subgoals were dictated which often had little meaning ("I wonder what this board is for") because of the lack of perspective.

Differences in Acceptance of the Group Goal.—It was possible to make judgments concerning individual and group acceptance of club goals from the following criteria: (*a*) change of behavior when the leader left the club; (*b*) presence or absence of motivation when the leader arrived late; (*c*) expressions of discontent for the club work; (*d*) carefulness of work; (*e*) creative suggestions in regard to club projects; (*f*) pride in the products of club effort.

In the submissive autocracies 74 per cent of the time while the leader was in the room was spent in serious work, but with the leader out this proportion dropped to 29 per cent and "distracted work atmosphere" increased from 6 to 20 per cent. In the atmosphere of aggressive reaction to autocratic leadership serious work periods dropped from 52 per cent with the leader present to 16 per cent while the leader was out of the room, with a corresponding rise in distracted work and horseplay. As compared to these striking evidences of lack of identification with the coercively induced work goals in the autocratic atmospheres the data on the democratic clubs indicate a negligible shift from 50 per cent "serious work atmosphere" with the leader in to 46 per cent with the leader out. A similar lack of effect of the adult leader upon the pattern of the club atmosphere was discovered in the laissez-faire clubs.

Data concerning the third criterion, overt expressions of discontent with club activities, were cited in the previous section. They showed that there were about three times as many expressions of discontent in *laissez faire* and submissive autocracy as in the democratic clubs and about ten times as much in the atmosphere of aggressive overt reaction to authoritarian leadership.

Quantitative work output (in which the submissive autocracies led the other groups) cannot be taken as an evidence of group goal acceptance in comparing groups which differ in regard to the amount of coercive force exerted by central persons, but probably the care with which work is carried through and the number of suggestions for the improvement of group effort should furnish some valid clues. Comparisons, such as photographs of murals painted by all the clubs, indicate much more care for detail and less "slopping of paint" in the products of the democratic clubs, and it was found that boys in the groups with democratic leaders made 7 suggestions for group action to every 3 such remarks by members of the aggressive autocracies and laissez-faire groups and 1 similar contribution by members of the submissive autocracies.

No systematic data can be given on group differences in pride concerning club products but several observations may be cited. For instance, in one authoritarian club the members made destructive attacks upon the products of their own labor, theatrical masks, after the final meeting of the club, while in the parallel democratic club one of the finished masks was presented to the school teacher and the others were taken home and used for room ornaments.

"Seeking Recognition" Behavior of Average Member

	From the adult	From four fellow members	Ratio
Aggressive autocracy	11	14	1.3
Submissive autocracy	6	4	0.7
Democracy	5	18	3.6
Laissez faire	2	19	9.5

Sources of Social Approval for the Average Boy

	Given by adult	Given by fellow member	Ratio
Autocracy	66	19	0.3
Democracy	26	26	1.0
Laissez faire	12	21	1.7

The Conflict of Cooperative Group Goals and Individual Ego Goals.— Besides the fact that enforced group goals were not enthusiastically accepted by the members of the authoritarian clubs another constellation of forces was discovered which hampered the progress of the autocratic clubs toward their group goals. In the previous section on disruption of group morale it was noted that the authoritarian group atmosphere produced (in the case of the aggressive reaction) more ego-centered competitive behavior than did the democratic social climates. These conflicts seemed to focus largely upon a competition for social recognition and approval from the adult leader. As the social structure of the situation was analyzed more completely it was concluded that motivation to contribute effort to the group goal was derived to some extent from reinforcing social approval for efforts already made. Because of the rigid status hierarchy in the authoritarian situation which set the adult leader off as the only person who could do any leading, the adult leader was the chief source of recognition for good work, as contrasted to a shifting boy leadership in the other two atmospheres. In democracy the boys more freely praised each other's work, while in autocracy the only way to get praise was to get it from the adult.

A "vicious circle of ego involvement" developed in the aggressive reaction to authoritarian situations, for as competition for social approval from "the source" increased the boys became less inclined to recognize with approval the work of one another. This insecurity tended to result in a continually increasing preoccupation with ego competitions and a loss of orientation toward joint group goals. In the democratic situation, where "recognition security" could be more readily gained, cooperative efforts more easily emerged and were maintained by continuing reinforcement. In the laissez-faire situation child leadership efforts were readily rewarded with group recognition, but lack of adult guidance usually meant that the leadership efforts to develop cooperation broke down.

A similar difference in the orientation toward leader approval rather than boy approval is shown by the second tabulation on page 505.

On the basis of the observations reviewed in this section it has been concluded that cooperative group activity in the direction of group goals was impeded in the authoritarian situation not only by *a lack of identification with the group aims* (as induced by the leader) but also because the social structure of the situation produced *ego-centered ingroup conflicts* which resulted in individual efforts tangential to the direction of cooperative group progress.

Mention is made here of the analysis of individual differences in respect of this study, since it entails one major aspect of the methodology. One problem, for example, pertaining to the question of individuality as affected by the different group situations, is being studied by means of qualitative and quantitative analysis of the variability of the behaviors of the club members. Another problem upon which our data throw some light, with the aid of recently developed methods of factor analysis, is the old problem of the interrelationship between various human traits. A large number of measures were available on each boy (72 "scores"), and most of these were records of how the boy had actually behaved in the club, interview, school, and home situations. At the time of this writing the factor analysis of the individual-difference data is not complete. Certain trait clusters are already indicated. When these factors have been appraised, in the case of any single boy, a basis is laid for predicting his behavior and his emotional response in many different situations—including, for instance, whether he will react "well" to autocracy or to *laissez faire.*

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CHAPTER XXIX

SOCIAL BEHAVIOR OF PRESCHOOL CHILDREN*

MILDRED PARTEN AND S. M. NEWHALL

For many children, the nursery school provides the first prolonged opportunity to play with and adjust to human beings of their own age level. The forms this social behavior takes, the individual differences which may be observed, as well as the development of definitions and the discovery of a technique for measuring and recording objectively the extent of social participation, constituted the general aims of the present investigation.

The two related phases of this subject which will be reported here are: "social participation," or the degree to which each child participates in various social activities, and "leadership," or the extent to which the given child excels in directing the activity of others. Before discussing the results of these phases of the study, we had best consider the nature of the subjects and the technique of observing them, for only then can the results be adequately interpreted.

Subjects and Technique

Subjects.—The applicability of the findings of this study to other preschool children is a function of the similarity of those children to the subjects studied; only to the extent that the subjects afford a suitable sample can the results be legitimately generalized. This established principle requires a description of the subjects; otherwise the reader could not know whether the results apply to other children in whom he happens to be interested.

The 42 subjects attended, in 1926–1927, the nursery school maintained by the Institute of Child Welfare at the University of Minnesota. So far as feasible these children were selected as normal individuals without significant physical or mental defect. The age, sex, and intelligence quotient of each child, together with the occupational status of the father and the size of the family, are summarized in Table 1. This summarization is in the form of five frequency distributions showing the numbers of subjects falling in the various classifications. Age starts below two years in the table but that is because it was recorded at the commencement of the study; during actual experimentation all children were between two and five years. The sexes were about equally represented by the 22 boys and 20 girls. Intelligence quotients ranged from 81 to 145, while the average for the 42 subjects was well above the population norm of 100. Paternal occupation was classified on the basis of a combination of the Barr Scale for Occupational Intelligence and Taussig Industrial Classification (5). Thus Class I includes the highest or professional group, while semiskilled laborers constitute Class V. As the table shows, our sample was overweighted with children from the professional group. The children were of mixed national stock and came from families ranging in size from one to five, and averaging between two and three children.

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* The investigation on which this paper is based was undertaken in 1926–1927 as a Ph.D. dissertation in the Department of Sociology at the University of Minnesota, under the chairmanship of Dr. F. Stuart Chapin. The observations were carried on by Mildred Parten at the Institute of Child Welfare under the general direction of Dr. John E. Anderson, director of the institute, with Dr. Florence L. Goodenough as well as members of the thesis committee advising. The present report was adapted and rewritten by S. M. Newhall from the thesis (1) and from three articles appearing in the *Journal of Abnormal and Social Psychology* (2, 3, 4). Adapted with permission of the *Journal of Abnormal and Social Psychology*.

Table 1.—Distribution of the Children of This Study with Respect to Age, Sex, Intelligence Quotient, Occupation of Father, and Size of Family

Age	Numbers		I.Q.	*N*	Fathers' occupations		Family size	
Years and months	Boys	Girls			Class	*N*	Children	*N*
Under 2	2	2	80–89	2	I	13	1	5
2 to 2–11	9	5	90–99	3	II	6	2	15
3 to 3–11	8	6	100–109	8	III	11	3	11
4 to 4–11	3	7	110–119	11	IV	6	4	5
			120–129	11	V	6	5	6
			130–139	3				
			140–149	4				
Total	22	20		42		42		42

Conditions of Observation.—To permit the experiment to be either understood or verified by repetition, the essential conditions of observation must be stated. Most of the data were secured in the winter period from January to April; consequently, most of the observations were of indoor play. Data were taken at the same hour every day that the children were in the nursery school. This selected hour was a morning period from 9:30 to 10:30, during which free play was permitted. At this hour every child was allowed to play with any toys he wished and with any children, or with none at all, as he desired.

Two teachers or assistants were usually present in each room. They made relatively few suggestions to the children but were in sight in order to help settle any problems which developed. The sandboxes were opened at the beginning of the hour, the kiddy cars made available in another room, and nearly all toys were accessible to the children without assistance from adults. Since there were not enough toys of every type to go around, the rule was that a child who got a toy first could play with it until he left it; while in case of swings and large apparatus the children were required to take turns. A few activities were directed by adults during this hour, such as the painting of water-color pictures, washing dolls' clothes, or making valentines; but in no case were children solicited to join in these activities. If they did join, it was of their own volition.

Observational Sampling.—Representative results in a group study like this depend not only upon an adequate sampling of subjects but also upon adequate observations of those subjects. A method of repeated short samples was employed and proved to be satisfactory (6). A given child was observed for a period of 1 min. on each of a number of days. This technique assumed that short distributed samples are as good as the prolonged observations of the traditional diary method. Subsequent work has shown the superiority of the short-sample technique. Not only is less time necessary and more progress possible, but there is less chance of losing data. This is because the observer has an opportunity to complete his record after the brief observational period has come to an end. Short sampling also permits the employment of the following precautions.

As a precaution against bias, the children were observed in a predetermined order which was varied systematically every day. This prevented the selection of a child for observation on the basis of spectacular behavior or some other nonrepresentative temporary factor which might lead to atypical results. Furthermore, the observational order was such that during the course of the investigation each child was observed an equal number of times during the first 5 min. of the free-play hour, during the second 5 min., during the third 5 min., and so on. Thus each child's behavior was sampled in periods distributed throughout the observational hour. This seemed desirable because children might tend to behave differently at different times during the hour. Such a tendency could be due to freshness, fatigue, boredom, or some such factor. If one child was usually observed early in the hour and another late, a detected difference in behavior could be due to the time rather than to a real persistent difference between the two children.

The observer used a mimeographed form containing spaces for recording:

1. The name of the subject.
2. A letter symbol to indicate the degree of the given subject's social participation.
3. The names of the other children playing in the same group as the child under observation.
4. The number of children in the group.
5. A letter symbol to indicate leadership behavior.
6. A letter symbol to indicate whether the child was talking or quiet.
7. A brief description of the activity in which the child was engaged.
8. The child's remarks, if any.
9. A rough estimate of the fraction of the minute occupied by the observed activity. The significance of these various items will become more apparent later. Suffice it to say now that they include the entire basic data on social participation and on leadership and that they were sufficiently numerous to keep the observer quite busy during the minute observational periods.*

Observational Reliability.—A check upon the proficiency of observation seemed desirable, and for this purpose three assistants kept records simultaneously with the investigator. The assistants received no preliminary instruction other than a printed sheet giving definitions of the symbols used for recording. Each was given a stop watch, which was started upon signal from the investigator, and then all four observed the same child for the same minute. Each observer filled in the schedule independently in accordance with her understanding of the meaning of the symbols employed and the nature of the behavior displayed. Since four observers could not view the child from exactly the same position, one would expect a few differences in the records to be inevitable. Unfamiliarity with the procedure, for none of the assistants had studied it for more than a few minutes, might account for further inconsistencies. Just how much of the variation in the records of the several observers could be attributed to such factors and how much to real differences of interpretation cannot be ascertained. In any case, 16 children were observed in this test, and the proportion of recorded items identical with those of the investigator averaged 89 per cent for the three assistants, with a range of 86 to 92 per cent. These figures were considered to represent a degree of reliability sufficiently high to demonstrate that the data were not an important function of the observer. Thus it seemed reasonable to assume that errors of observation were not a seriously disturbing element in this investigation.

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* It should be noted that Items 3, 4, and 7 refer especially to a study of the nature of play groups which, for lack of space, is not described in the present report.

Social Participation

After several weeks of preliminary observation of the children, a scale of social participation was developed. This scale is based on six rather rigidly defined categories or degrees of social participation, and they will be illustrated and described in some detail.

Degrees of Social Participation.—One child, for instance, did not seem to be playing at all. He usually stood in the middle of the room pulling at a handkerchief which was tied to his blouse. His head dropped from one shoulder to the other. If asked what he wanted to do, he would merely shake his head; if a toy were placed in front of him, he would not look at it. This primary type of behavior was termed "unoccupied" and defined as follows:

> *Unoccupied Behavior.*—The child apparently is not playing at all, at least not in the usual sense, but occupies himself with watching anything which happens to be of momentary interest. When there is nothing exciting taking place, he plays with his own body, gets on and off chairs, just stands around, follows the teacher, or sits in one spot glancing around the room.

Somewhat above this lowest level of the scale is a form of activity called "playing alone" or "solitary play." The distinction between this and parallel play, to be described presently, is not striking. The italicized phrases in the definitions of solitary and parallel play will indicate the principal distinctions.

> *Solitary Play.*—The child plays alone and independently with *toys that are different* from those used by the children within speaking distance and *makes no effort to get close to* or speak to the other children. His interest is centered upon his own activity, and he pursues it without reference to what others are doing.

A child who observes a group of children playing, but who himself does not overtly enter into the play activity, is called "an onlooker." His observation indicates some social interest and that places him at a higher level than the preceding.

> *Onlooker Behavior.*—The child spends most of his time watching the others play. He often talks to the playing children, asks questions, or gives suggestions, but does not enter into the play himself. He stands or sits within speaking distance of the group so that he can see and hear all that is taking place. Thus he differs from the unoccupied child, who notices anything that happens to be exciting and is not especially interested in groups of children.

Closely related to solitary play is the type of group activity already mentioned, which was named "parallel play." For instance, in the sandbox situation, several children are engaged in filling cups with sand. Each child has his own cup and fills it without reference to what the other children are doing with their cups. There is very little conversation about what they are making. No one attempts to tell who may or may not come to the sandbox, so children are coming and going all the time. This parallel play better resembles group play and is regarded as a more socialized form than either solitary play or onlooker behavior.

> *Parallel Play.*—The child plays independently, but *the activity he chooses naturally brings him among other children.* He *plays with toys which are like those* which the children around him are using, but he plays with the toys as he sees fit and does not try to influence the activity of the children near him. Thus he plays *beside* rather than *with* the other children (*cf.* solitary play above).

Two further types of play were defined and these were named "associative play" and "cooperative" or "organized supplementary play." Associative play is obviously group activity, for in it there is overt recognition by the group members of their common activity, interests, and personal associations. This form of play may be illustrated in the sandbox situation as follows: The children borrow one another's cups, they explain why they need two cups; they advise and offer sand to one another. They call a child to the sandbox and ask those present to make room for him. The others may or may not move over, depending on their wishes. No child or children dictates what another shall make; rather each makes whatever he pleases. Someone may suggest that they all make a road, but in that case each child makes his own road, or none at all, as he chooses. The other children do not censor. There is much conversation about the common activity.

Associative Play.—The child plays with other children. There are borrowing and lending of play material; following one another with trains and wagons; mild attempts to control which children may or may not play in the groups. All engage in similar if not identical activity; there is no division of labor and no organization of activity. Each child acts as he wishes, does not subordinate his interests to the group.

Cooperative or organized supplementary play is the most highly organized group activity. In it appear the elements of division of labor, group censorship, centralization of control, and the subordination of individual desire to that of the group. In the sandbox situation, for instance, one child might suggest that they are all making supper. Soon the various family roles are assigned or adopted and the children speak of their shares in preparing the meal. Domination by one or more of the children occurs, one child being informed that he cannot cook because he is the baby. The group becomes closed to some children and open to others, depending upon the wishes of the leaders. The children are criticized by one another when they do not play their roles correctly. They are not permitted to leave the sandbox unless it is known what they are going to do next.

Cooperative or Organized Supplementary Play.—The child plays in a group that is organized for the purpose of making some material product, of striving to attain some competitive goal, of dramatizing situations of adult or group life, or of playing formal games. There is a marked sense of belonging or not belonging to the group. The control of the group situation is in the hands of one or two members, who direct the activity of the others. The goal as well as the method of attaining it necessitates a division of labor, the taking of different roles by the various group members, and the organization of activity so that the efforts of one child are supplemented by those of another.

The classification of the given child with respect to the six categories above was recorded by the observer as Item 2 on the schedule. A given child was found to fall in different categories on different occasions.

Observed Amounts of Social Participation.—The per cent of the 1-min. observations of each child which were classified in each category of social participation is presented in the body of Table 2. The first column gives the designation of the child, the second shows the total number of minute periods in which the child was observed, and the words at the heads of the remaining six columns refer to the six categories of social participation. Thus, for instance, child *J*4 (the top of the first column) was observed a total of 33 times, gave evidence of unoccupied behavior on none of these occasions, showed solitary behavior in 6.2 per cent of the 33 periods, showed onlooker behavior in 15 per cent of the periods, and so on. The per cent entries in any row should sum to approximately 100.

TABLE 2.—THE RELATIVE FREQUENCY WITH WHICH EACH CHILD EVINCED SOCIAL PARTICIPATION OF EACH DEGREE

Child	Total observations	Per cent					
		Unoccupied	Solitary	Onlooker	Parallel	Associative	Cooperative
*J*4	33	....	6.2	15.0	27.0	27.0	25.0
*I*4	43	....	15.0	5.0	35.0	35.0	11.0
*H*4	41	....	17.0	20.0	46.0	15.0	2.4
*G*4	42	....	7.6	24.0	12.0	33.0	24.0
*F*4	40	....	10.0	5.0	30.0	30.0	25.0
*E*4	98	....	17.0	....	33.0	33.0	17.0
*D*4	97	....	7.0	4.1	20.0	48.0	21.0
*C*4	96	....	7.0	2.3	35.0	35.0	20.0
*B*4	78	....	5.2	9.0	32.0	34.0	20.0
*A*4	29	....	3.4	3.4	31.0	31.0	31.0
*N*3	79	....	1.2	1.2	8.0	33.0	57.0
*M*3	100	....	18.0	5.0	51.0	18.0	8.0
*L*3	76	....	12.0	11.0	22.0	33.0	22.0
*K*3	76	....	25.0	12.0	25.0	33.0	5.2
*J*3	77	....	15.0	9.0	33.0	21.0	22.0
*I*3	82	....	6.2	3.4	15.0	37.0	39.0
*H*3	70	....	11.0	4.1	25.0	30.0	30.0
*G*3	75	....	22.0	5.2	33.0	23.0	17.0
*F*3	71	....	4.1	4.1	26.0	45.0	20.0
*E*3	89	....	33.0	7.0	43.0	15.0	2.4
*D*3	82	....	20.0	7.0	33.0	20.0	20.0
*C*3	80	....	3.4	6.2	34.0	21.0	36.0
*B*3	89	....	8.0	2.0	32.0	28.0	30.0
*A*3	92	....	10.0	2.4	33.0	35.0	20.0
*N*2	87	....	30.0	3.4	32.0	20.0	15.0
*M*2	78	....	17.0	12.0	9.9	37.0	25.0
*L*2	85	....	17.0	11.0	54.0	11.0	8.0
*K*2	90	11.0	23.0	38.0	20.0	7.0	1.0
*J*2	73	....	20.0	5.5	50.0	20.0	5.5
*I*2	78	12.0	33.0	10.0	44.0	....	1.4
*H*2	73	....	33.0	12.0	34.0	20.0	1.3
*G*2	88	3.4	26.0	11.0	39.0	17.0	4.1
*F*2	74	....	12.0	15.0	33.0	33.0	6.0
*E*2	64	....	25.0	11.0	40.0	12.0	12.0
*D*2	64	....	25.0	4.6	50.0	20.0	1.0
*C*2	86	3.0	35.0	8.0	20.0	26.0	7.0
*B*2	77	....	21.0	1.2	42.0	40.0	6.2
*A*2	19	....	5.2	20.0	35.0	35.0	5.2
*D*1	75	12.0	9.0	6.0	62.0	8.0	2.0
*C*1	77	....	25.0	2.5	48.0	22.0	3.0
*B*1	68	2.9	30.0	10.0	50.0	7.0	1.4
*A*1	12	....	17.0	....	58.0	17.0	8.0

Several facts are evident from inspection of the table. There were marked individual differences in the proportion of time children were observed to be engaged in each type of activity. Unoccupied behavior proved to be the least frequent by far, there being only six children who engaged in it at all; onlooker behavior was next to the least frequent. On the other hand, parallel behavior was the most frequent, and all the children engaged in play of this type; associative behavior occurred nearly as often. Cooperative and solitary behavior were intermediate in amount. These general facts can be rationalized to some extent by considering extreme individual cases in relation to further information from the schedules.

The three children who were *unoccupied* more or less habitually, *viz.*, *K*2, *I*2, and *D*1, were all less than three and one-half years of age; all had older brothers and sisters; and they were the least talkative children in the school. The four children who engaged in *solitary* behavior as much as a third of the time, *viz*, *E*3, *I*2, *H*2, and *C*2, were younger than the average but they had all been in the nursery school longer than the average of the children. Hence their solitariness could not be explained by lack of opportunity for acquaintance. The mothers of two of the four children were interviewed, and a correspondence between school and home behavior became apparent. This tended to confirm the reality of the solitary behavior of these children even though it remained unrelated to other factors.

Child *K*2, who was observed to be an *onlooker* 38 per cent of the time, was also unoccupied much of the time. He took longer than any other child to adjust to group situations; he was not observed playing with another child until 3 months after entering nursery school. One teacher thought his reticence might be due to his large size for his age, because for that reason he had been placed with older children during music and conversation periods. It was thought that he must have felt their mental and physical superiority and lacked courage to assert himself. At home this child had two older brothers and two older sisters who "took care of him." In general, there were probably elements in common between unoccupied and onlooker activity because children who ranked relatively high in the one usually ranked high in the other.

Parallel play was participated in more by the younger than by the older children. This may be explained in part by the fact that the sandbox is a type of toy which facilitates *parallel* play as well as being quite a favorite among the younger children. Six of the eight children who were occupied with parallel play over 50 per cent of the time had less nursery-school experience than the average child. But the length of the period of school attendance correlates with age, and so it seemed reasonable to attribute parallel play in part to the age factor.

Sixteen children engaged in *associative* group behavior during more than one-third of the observations. Since as many as 12 of these were over three years old, one might infer that overt interest in playmates and their activities is largely confined to the older pre-school children. *Cooperative* as well as associative play appears to be a function of age; for all six of the children who engaged in cooperative play more than 30 per cent of the time were more than three years old, whereas the five individuals who were observed in cooperative situations less than 2 per cent of the time were all less than two years, eleven months. The mean I.Q. of the six most cooperative was 120 as compared with the mean of 113 for the five least cooperative. Thus intelligence as well as age appears to be something of a factor in cooperative play.

A scale was formed by assigning arbitrary weights to the several categories in accordance with their rank order of degree of social participation; then the score of a given child could be computed by multiplying the number of times he was classified in each category by the weight assigned to that category, and then finally finding the algebraic sum of the products. The weights were as follows: -3 (unoccupied), -2 (solitary), -1 (onlooker), 1 (parallel), 2 (associative), 3 (cooperative). Suppose, for the sake of illustration, that out of 10 observations, a child was unoccupied 0 times, solitary 1 time, onlooker 2 times, parallel 5 times, associative 2 times, and cooperative 0 times. Then the child's total or composite score would be:

$$(-3 \times 0) + (-2 \times 1) + (-1 \times 2) + (1 \times 5) + (2 \times 2) + (3 \times 0) = 5.$$

Teachers' estimates were secured from three teachers and two assistants, who had spent varying amounts of time with the children during the free-play period in the year of the investigation. The scheme of estimation called for the comparison of each child with every other in the school. Complete descriptions of the categories of social participation were provided, although only parallel, associative, and cooperative activity were actually estimated in this comparison. The teachers made their estimates on 34 children at the end of the study and expressed difficulty in remembering sufficient detail for the purposes of the record. The estimates were converted into numerical ratings by applying to them the system of weights defined above. Then the ratings were correlated with the composite social-participation scores based on 60 observations of each of the same 34 children. These correlations for the ratings of the five teachers taken separately were: .59, .65, .71, .75, and .79.* When the ratings of two, three, four, and five teachers were combined, the correlations were, respectively: .80, .79, .84, and .88. All the above correlations are significant in the sense that all the coefficients are greater than five times their probable errors. The intercorrelations of the ratings of the five teachers ranged from .41 to .66.

These rating results indicate: (*a*) that the agreement between the social-participation ratings derived from the general impressions of teachers and those obtained from the systematic observations was fairly close; (*b*) that the combined ratings of several teachers correlate more highly with direct observation than do those of any one teacher; and (*c*) that there is considerable uniformity in the scoring of different teachers. These results tend not only to validate the systematic data but also to justify, when necessary, the substitution of teachers' ratings for such data.

Age and Social Participation.—Evidence of a relation between age of children and degree of social participation has been adduced already. The older children were found to play in the highly organized groups (associative and cooperative) more than the younger children. These results are confirmed in Fig. 1, which groups the children in consecutive half-year intervals, making a total of five age groups. There are six children representing each age. The illustration shows the average number of times (out of a total of 60 observations on each child) in which the six children at each age level participated in the various social groups. Striking age differences are apparent from inspection of the illustration. Thus, for example, it is clear that children in the highest age group (black columns) were never classified as unoccupied, rarely designated as solitary or onlooker, but very often found in parallel, associative, or cooperative play groups.

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* The Spearman rank-difference method was used for all correlations in this paper.

The general relationship between age and social participation can be represented by a single coefficient secured by correlating age with a composite social-participation score covering all categories. The value of this coefficient is .61 ± .08.

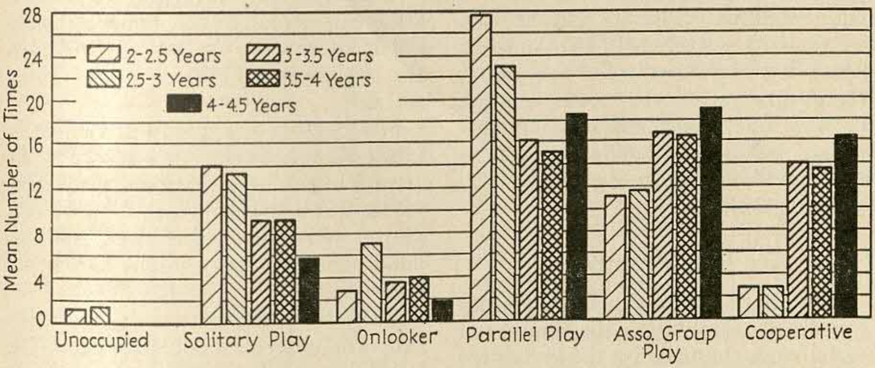

FIG. 1.—Mean number of times each activity was observed at different ages. (*From J. abnorm. soc. Psychol.*, 1933, **27**, *p*. 260.)

A further word may be written concerning the interpretation of this relationship. Age might be correlated with experience or length of attendance at the nursery school; for the longer children remain in the school the older they get. Therefore, it might be nursery-school experience which was really accounting for the observed correlation between age and social participation. Indeed, one might expect that familiarity with the nursery-school environment would determine the readiness with which children would enter into group play, *viz*., the degree of their social participation. Correlation of date of entrance with social-participation score, however, yielded the insignificant coefficient of .12. This indicates that nursery-school experience cannot account for the considerable observed correlation between age and social participation; it would seem that age itself, or other correlates of age, must be the causal factor.

Intelligence and Social Participation. A comparison of the intelligence quotients of the least cooperative and the most cooperative children has already suggested a dependency of social participation on intelligence, apart from age. A correlation of .26 ± .11 between the I.Q.'s and composite social-participation scores of 34 children points in the same direction.

Several further correlations are available between the I.Q.'s of all 42 children and social participation scores restricted to particular categories. These results are as follows: I.Q. and solitary behavior, −.20 ± .10; I.Q. and parallel play, .69 ± .06; I.Q. and cooperative play, .38 ± .09; I.Q. and associative combined with cooperative, .33 ± .10.

These coefficients also suggest a tendency for social participation to vary with I.Q., but the relatively high correlation in the case of parallel play seems out of line and deserves special consideration. It was pointed out above that the much-used sandbox is a type of toy which facilitates parallel play as well as being a favorite with younger children. Since parallel play is most popular among two-year-olds, it is conceivable that those young children who possess the most intelligence manage to play in elementary groups rather than alone. On the other hand, those two-year-old children who are least impressed by their new social environment in the nursery school will be content with solitary play. The fact that solitary play, which occurs most frequently among the younger children, was inversely correlated with I.Q., seems to substantiate this interpretation of the high direct correlation between I.Q. and parallel play. Those types of participation in which the older children primarily engage also correlated positively with I.Q., but to a lesser degree. Regardless of age group, there appears to be some relation between intelligence and social participation, but it is not so definite a relation as that between age and social participation.

Leadership

The study of social behavior is not concerned merely with the number of social contacts made by the individual child or the kinds of groups with which he identifies himself. It is also concerned with the role of the child in those groups, with the extent to which he is helping to shape the plans and activities of the group, *viz.*, with his leadership. Leadership is an essential component of organized group life; it may be defined as the extent to which the given individual excels in directing the activity of others.

Data on leadership were secured during the same observations and recorded in the same forms or schedules as the data on social participation. Since the technical details of observation have been described already, only the quantification of the concept of leadership remains to be mentioned. As in case of social participation, the categories were developed and defined only after considerable observation. In the case of leadership, unfortunately, they proved more difficult to apply.

Degrees of Leadership.—The child's role in the group, or his degree of leadership, was classified according to the five following categories:

1. Following another child's directions.

2. Neither directing nor following but independently pursuing own ends or desires.

3. Both directing and following, *i.e.*, holding an intermediate position wherein he directed some children and followed others.

4. Reciprocally directing or sharing leadership equally with another child, either alternating the leadership or by the two mutually directing the group activities.

5. Directing the group by himself.

Leadership behavior was recorded as Item 5 in the investigator's form. The games and toys with which the children played were also referred to for the additional light they might throw on leadership.

Only the extremes were easily classified. The observer's subjective impressions, received from the tones in which commands were given and the willingness or reluctance with which they were obeyed, were the deciding factor in cases of doubtful classification. The following examples of behavior were all classified as *directing;* they illustrate a lack of clear-cut distinctions:

Commanding another child to do something he has not started to do.

Showing a child how to do something which he planned to do or was already doing, by criticizing the method of performance: "No, the other way"; "Look out"; "Do it this way." Criticizing the length of time taken: "Hurry up"; "Don't go so fast"; "Wait until I get baby's wraps on."

Telling another child that he cannot do something he wishes to do, or giving him permission to do something: "You can't come in"; "You can play with us."

Suggesting some activity and asking the child if he would like to imitate another; "Play you are all stuck in the mud"; "Let's do this"; "Would you like to sit in the sand like me?"

Playing a directing role: mother, traffic cop, teacher, driver.

Assigning roles to everyone: "You are my little boy"; "Now I'm the doctor."

Insisting upon having his own way: "No, I'm going to tie my shoelaces"; "I can come if I want to."

Directing one child to direct another: "Don't let him come up."

The complexity of the phenomenon of leadership is even more marked than these verbal illustrations indicate. Frequently, not words but actions, gestures, and facial expressions conveyed orders to children. This was particularly true when brute force was used to compel obedience. Diplomatic directing was even more difficult to recognize. Roundabout suggestions were made that would lead to the desired end, but often the end could not be perceived directly and so many cases of artful leadership may have been overlooked.

Observed Amounts of Leadership.—The per cent of the 1-min. observations of each child which were classified in each category of leadership is presented in Table 3. (This table is set up like Table 2.) The first column designates the child, the second gives the total number of observations on that child, and the headings above the remaining five columns are the five chosen categories of leadership. Thus, for instance, child *J*4 (top of the first column) was observed a total of 33 times, gave evidence of *following* behavior in 26 per cent of the 33 observational periods, *independently* pursued his own ends in 52 per cent of the periods, and so on. The five entries in any row sum to approximately 100.

As in social participation, there were marked individual differences in the proportion of time children were engaged in each type of activity. *Directing and following* was by far the least frequent type of leadership behavior, while *following and directing* were about tied as next to the least. *Independent* pursuit of own ends was by far the most frequently manifest. *Reciprocally directing* (shares leadership) was next to the most frequent. These general facts may be supplemented by a brief consideration of cases.

A comparison of the three children (*J*4, *I*3, *H*3) who *followed* most, over 25 per cent of the time, with the three children who never followed (*I*4, *H*4, *N*3) showed no striking differences in intelligence, age, occupational level, nationality, or number of siblings. The three greatest followers were, however, found in the roles of director and reciprocal director more frequently than the average child. Furthermore, they played more frequently with *N*3, the greatest leader, than did any other child; and only once was one of these followers found to follow the directions of a child other than *N*3. It is the investigator's impression, moreover, that these three young followers employed the same brute-force methods as their leader. Thus the technique of leadership is sometimes learned, perhaps, through following a forceful leader.

All 42 children exhibited *independent pursuit* of their own ends in amounts ranging from 15 per cent to 99 per cent of the time. This activity is evidently characteristic of preschool children in general and not linked in any obvious way with special characteristics. Both *directing and following* was never observed in the majority of the children and rarely in the rest. Again, no obvious correlation was apparent.

The four children who were most frequently observed in the role of *reciprocal leadership* were all older than the four found in that role least often. Possibly the age difference in this mutual directing depends upon improved command of language with age. Language is important in reciprocal directing, wherein alterations of plans and adjustments of the wills of two individuals often must take place before overt activity begins. The high social-participation scores and the large numbers of playmates of the reciprocal leaders indicate that they are a more social group than children who rank low in mutual directing.

TABLE 3.—THE RELATIVE FREQUENCY WITH WHICH EACH CHILD EVINCED LEADERSHIP OF EACH DEGREE

Child	Total observations	Per cent				
		Follows	Independent	Follows and directs	Shares leadership	Directs
*J*4	33	26.0	52.0	...	22.0	
*I*4	43	....	77.0	...	20.0	2.4
*H*4	41	....	87.0	...	12.0	
*G*4	42	5.0	55.0	2.4	26.0	12.0
*F*4	40	5.0	57.0	...	30.0	8.0
*E*4	78	17.0	58.0	1.2	22.0	2.5
*D*4	97	2.2	53.0	1.1	17.0	27.0
*C*4	80	1.1	54.0	1.1	27.0	7.0
*B*4	78	12.0	53.0	1.1	33.0	1.1
*A*4	29	15.0	50.0	...	32.0	3.4
*N*3	79	....	15.0	3.0	15.0	67.0
*M*3	100	1.0	84.0	1.0	9.0	5.0
*L*3	76	23.0	56.0	...	21.0	
*K*3	76	1.2	84.0	...	10.0	5.2
*J*3	77	2.5	68.0	2.5	22.0	5.2
*I*3	82	25.0	39.0	1.2	23.0	12.0
*H*3	70	25.0	57.0	1.3	17.0	
*G*3	75	4.0	73.0	1.2	22.0	
*F*3	71	17.0	47.0	4.1	25.0	7.0
*E*3	89	1.1	86.0	...	12.0	1.1
*D*3	82	10.0	70.0	...	20.0	
*C*3	80	7.0	50.0	3.4	33.0	7.0
*B*3	89	6.0	59.0	2.4	23.0	10.0
*A*3	92	1.1	62.0	...	20.0	17.0
*N*2	87	3.4	73.0	2.4	15.0	7.0
*M*2	78	5.0	50.0	1.2	32.0	12.0
*L*2	85	2.4	87.0	...	10.0	1.1
*K*2	90	1.5	99.0			
*J*2	73	5.5	84.0	...	11.0	
*I*2	78	1.4	97.0	...	1.4	
*H*2	73	6.0	85.0	...	8.0	1.3
*G*2	88	3.4	89.0	...	7.0	1.1
*F*2	74	7.0	80.0	...	12.0	1.1
*E*2	64	1.5	83.0	...	15.0	1.5
*D*2	64	1.5	89.0	...	5.0	4.6
*C*2	86	3.0	79.0	...	17.0	1.1
*B*2	77	1.2	86.0	...	13.0	
*A*2	19	5.2	85.0	...	5.2	5.2
*D*1	75	2.5	95.0	...	2.0	
*C*1	77	7.0	84.0	...	9.9	
*B*1	68	2.9	93.0	...	4.1	
*A*1	12	17.0	75.0	...	8.0	

Fourteen children were never observed *directing* group activities, and only three appeared as directors in more than 15 per cent of the observations. The "big boss" was child *N*3, who directed in 67 per cent of the observed situations. The sexes were equally represented in both reciprocal and exclusive directing.

Artful and Brute-force Leaders.—Two types of directing, artful and forceful, were particularly evident in the cases of girl *D*4, aged four years four months, and boy *N*3, aged three years eleven months. Differences between their methods of leading are indicated in these excerpts from their conversations.

*D*4, THE ARTFUL DIRECTOR

"You haven't a strong enough stick; I have."

"Honey, don't play with mama's dishes."

"Helen, don't go in there because he hit me. I'll give 'im a good sock in the head. Helen, get out, or I'll tell your mother you are awful mean."

"Joan, you can give me a ride on the back of yours [kiddy car] and Lawrence can give me a ride on the back of his."

"Now, who wants a turn? Get out Catherine and ask Dorothy to come."

"Gwendolyn, what do you want to be with the wagon?" [Circus.] "Helen, what do you want to be? Do it some more, Helen."

"Now, Helen, now you put it in here."

"Sit on one of the new chairs, Mary Jane."

*N*3, THE FORCEFUL DIRECTOR

"Are you doing what I tell? Don't put it down."

"Hey, you can't get up there. No. Watch."

"This is going to be the jail. Get off."

"Who wants to slide down? No, not you. Kids, let's bed."

"Stop, we have to go to the battery shop. Come in and say you want a battery."

"All of us are daddies. Come on and park your cars. Park them like this."

"Now I'll tell you when it's time to get up."

"Bob, I told you to go downstairs and stay there. I made him cry."

"Play with me. Lay down there, can't you?"

"You sit there."

Very interesting was a difference in the number of children directed by the "bully" *N*3 and the "diplomat" *D*4. During 20 observations *N*3 directed only 13 different children, and 10 of these he directed only once. In general his efforts were concentrated on a few children, who formed his "gang." During the 20 observations he directed one child, either alone or in a group, 10 times, a second child 7 times, and a third 6 times. *D*4, on the other hand, artfully directed 20 different children during 20 observations. Judging from his conversation, it would seem that *N*3's groups were limited in size partly because other children than those in his gang were afraid of him and partly because he closed his groups to all but a few select friends. *D*4, on the contrary, increased her followers by soliciting individuals to enter her group.

Leadership Scale.—A leadership scale was formed by assigning arbitrary weights to the leadership categories in accordance with their order of degree; then a leadership score for a given child could be computed by the same method as the social-participation scores. The weights for the leadership scale were: -2 (following), -1 (independent pursuit), 1 (directing and following), 2 (reciprocally directing), and 3 (directing alone).

The leadership data were validated against teachers' ratings by a procedure similar to that employed in the case of social participation. The teachers were requested to recall with what children the given child had played for as much as a week or longer and to mark each of their names with scale symbols, to indicate the degree to which the child dominated his social contacts with these children. These estimates were converted into numerical ratings by application of the system of weights assigned above; and then the ratings were correlated with the composite leadership scores based on 60 observations of 34 children. The correlations for the ratings of the five teachers taken separately were: .53, .54, .65, .70, and .71. When the ratings of 2, 3, 4, and 5 teachers were combined the correlations were respectively: .77, .83, .82, and .81. All the above correlations are significant in the sense that all the coefficients are greater than five times their probable errors.

These results show considerable agreement between individual teachers' ratings and leadership scores and considerable agreement between the ratings of different teachers. On the whole, the leadership ratings do not correlate so closely with the scores derived from controlled observation as did the social-participation ratings. Nevertheless, the agreement seems close enough to warrant the use of teachers' ratings of leadership made from their recollections, when the 1-min. sampling method is impractical.

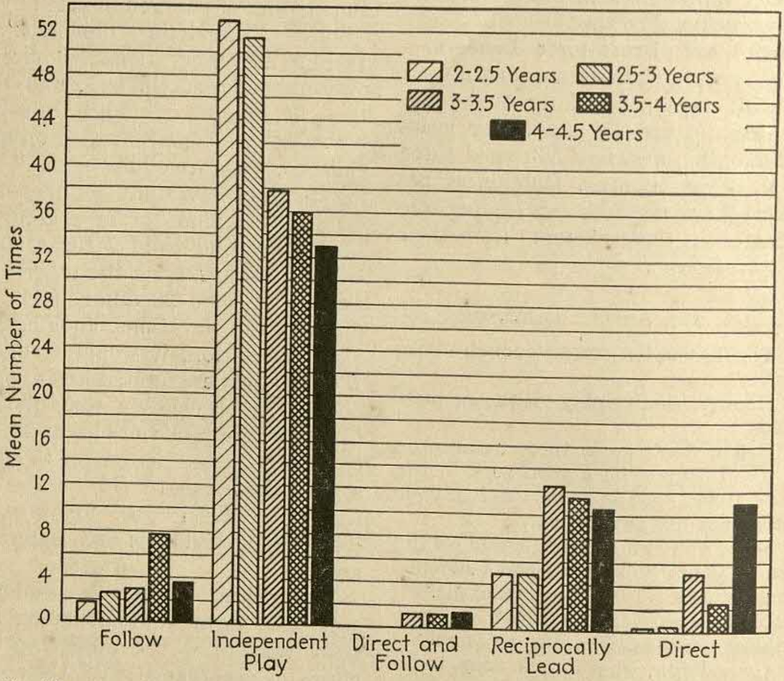

FIG. 2.—Mean number of times each leadership activity was observed at different ages. (*From J. abnorm. soc. Psychol.*, 1933, **27**, *p.* 439.)

Social Participation and Leadership. Since a child cannot very well lead others without participating in social groups, a substantial positive correlation is to be expected between social participation scores and leadership. The obtained correlation was .97.

Age and Leadership.—Figure 2 is arranged like Fig. 1 and it shows that leadership is related to age. This illustration exhibits the percentage frequency of each degree of leadership at each half-yearly age level between two years and four years and six months. Following behavior is seen to increase in frequency at the early ages, to reach a peak in the third year, and to decline in the fourth. Independent pursuit steadily declines with age. The intermediate status of both directing and following does not appear until the third year and shows no tendency to increase thereafter. Reciprocal leadership reaches its maximum in the third year and replaces much of the independent play which was lost in that period. The directing activities are relatively the most frequent at the highest age level.

When age was correlated with leadership scores on only the low category of neither following nor directing, the result was −.79. On the other hand, the correlation between age and leadership scores of the highest directing category was .53. This inverse relation with lack of leadership and direct relation with high leadership harmonizes with a correlation of .67 between age and the general or composite leadership scores based on all categories. These correlations are statistically significant. Thus considerable correspondence is established in the variation of age and leadership. It is interesting to note, however, that age may not be the essential factor, for the correlation of height with composite leadership proved to be .67 also. The obvious deduction was a common factor, and so when age and height were correlated the high coefficient of .92 was not a surprise.

The question of the bearing of nursery-school experience on social behavior has been raised before, and it was decided that the correlation of .12 between such experience and social participation could not account for the substantial observed correlation between age and social participation. The very high correlation of .97 between social participation and leadership indicates, further, that nursery-school experience could scarcely account for the correlation between age and leadership. Social participation and leadership are correlated so closely that a lack of relation with the one must mean a lack of any considerable relation with the other.

Intelligence and Leadership.—Evidence of a relation between intelligence and leadership was found in a comparison of the seven children receiving the highest leadership scores with the seven receiving the lowest scores. The mean I.Q. of the seven leaders was 122, with a range of 111 to 134; for the seven non-leaders it was 110 with a range of 85 to 125. The general correlation between I.Q. and composite leadership scores was .34 ± .10. These figures indicate a tendency for leaders to possess high intelligence, but the latter is no guaranty of leadership. Six of the seven leaders came from families in the three upper occupational classes, whereas only three of the nonleaders came from the higher levels. Thus there was also a suggestion that leadership might be related to occupational status of parents.

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CHAPTER XXX

A SOCIOMETRIC STUDY OF EMOTIONAL AND SOCIAL EXPANSIVENESS*

HELEN H. JENNINGS

Introduction

Each individual early displays selective affinity between himself and persons around him. He may approach those who respond to him or whom he wishes to respond to him; he may keep away from those whom he feels he cannot interest or who repel him. This reaching out of the individual to other individuals may be said to be a projection of the self, a seeking for fulfillment of a need of the individual for other persons to whom he responds, drawing him to them and causing him to want to include them in his life situation. Such choice behavior may be considered at the base of social behavior generally. It represents directly the sustaining emotional reinforcement of different individuals by one another.

An exploration of individual differences in respect to emotional and social expansiveness should penetrate below the outer observable manifestations of interaction between persons and elicit the individual's full expression for or against contact with those who surround him. The present investigation attempts to realize this premise.

J. L. Moreno's sociometric approach to the problem of interpersonal relations led the way for this study (5). The sociometric test, devised by Moreno, taps the choice aspect of the individual's projections. The simplicity of the test, its lack of resemblance to a "test" in the minds of the subjects, and the fact that its results may be utilized to reorganize the functioning of the group according to the structure it uncovers, work in favor of securing the actual network of relationships existing in the population tested because of the fundamental fact that the choices in sociometric testing are always related to the life situation of the subject.

The sociometric test allows the individual to become an agent in his own behalf, to give his personal feeling for others in the form of choices for functioning with them within the group of which he and they are members. In this regard, he acts in order to remake the collective of which he is a part. Thus, to the subjects, the test is not a "test" at all. The wording of the test for grammar-school classes, for example, was as follows:

> You are seated now according to directions your teachers have given you. The neighbor who sits beside you is not chosen by you. You are now given the opportunity to choose the boy or girl whom you would like to have sit on either side of you. Write down whom you would like first best; then, whom you would like second best. Look around and make up your mind. Remember that next term

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* From a sociometric study of emotional and social expansiveness at the adolescent age level. More extensive treatment of this subject will be found elsewhere (4).

your friends you choose now may sit beside you (5, page 13).

The form of the sociometric test as used up to the present has had three characteristics:

1. A specific number of choices is allowed (varying according to the size of the groups tested).
2. A specific criterion for choice is used, varying with the functional activity of the group (*e.g.*, as above, studying in proximity).
3. Different levels of preference are designated for each choice (first, second, etc.).

From its original conception by Moreno, the sociometric test has focused upon the organization, the psychological structure, of groups. Moreno has defined it as "an instrument to measure the amount of organization shown by social groups" (5, page 432). The test has proved well fitted to fulfill the task set for it. It has penetrated beneath the overt manifestations of group life to the invisible network of interrelations on which they are built.

First administered to the population of Public School 181, Brooklyn, N.Y., under the condition of allowing two choices for studying with others (occupying adjoining seats), the sociometric test there disclosed that the child gains, with increase in age, increasing ability to establish mutual relationships with other individuals to whom he is drawn (5, page 60). The concept of personality which pictures the organization of the individual as moving from the general to the specific, from the undifferentiated to the highly differentiated, was found to have a counterpart in the growth of interpersonal organization of groups of individuals from the kindergarten level through the eighth grade. Group organization, too, is seen to progress from a simple, loosely integrated structure to one of increasingly greater complexity, offering additional evidence as to the course of maturation so long known to be characterized by this principle. Freud's theory, also, of the period of latency of sex in childhood was found to be experimentally confirmed by the age points at which cleavage between the sexes appeared in group structure (5, page 61): starting in the fourth grade (about age nine) and lasting well up to the eighth-grade classes (about age thirteen), boys choose boys and girls, girls, almost to the total exclusion of the opposite sex; then intersexual choices again begin. Racial cleavage also appeared most marked during this period (5, page 61), and the motivations given by the children often reveal racial similarity to be an attractive factor in choice (2, pages 387–400). The same trends in results were obtained when the test of the same school was repeated about two years later, after a turnover in population of nearly 50 per cent (5, pages 23–66). The characteristics of classroom structure at different age levels was further revealed by Criswell's study of three public schools of New York selected to have a varying percentage composition of Negro-white pupils (1, page 16). Criswell found that even radically different racial composition in the membership of the classroom does not produce a unique response on the part of one race (colored or white) toward the other and that race cleavage, at whatever age levels it appears, is quantitative rather than qualitative: a lessened frequency of positive responses passing between individuals of different race (1, page 180).

As administered to the closed community of the New York State Training School for Girls, whose members numbered over 400, under the condition of allowing five choices for living in the same group, the sociometric test, thus defined, was found sufficiently productive to permit an analysis of the whole community so as to further an understanding of the conduct of groups within it (5, pages 197–232). Under similar conditions, except for a three-choice allowance, one study of the development of structures within the same group, retested at 8-week intervals over a period of 2 years 7 months, was made in this community (3). Structure could be seen not as a flat proximity of part to part but as a hierarchical interrelation of parts in ratio to the dependence of one part upon another within the developing organization as a whole (3, page 122). However, the individual's capacity to relate himself to others remained unexplored because of the nature of the testing technique used; the focus had to be on a structural analysis only.

The emphasis of the present research is shifted away from the organization of the group back to the individual, and to this end the sociometric test was reoriented: (*a*) by setting no limit on number of choice expressions; (*b*) by allowing the individual equal freedom to express negative choice reactions of rejection; (*c*) by testing concomitantly on all criteria of significance to the subject; and (*d*) by asking the subject to assign to his expressions whatever preference levels they may have for him.*

Secondly, it was desired to study the consistency of choice behavior for the same individual at different times sufficiently distant to permit of significant change taking place and being recorded; hence, the full expression of the subject toward others, under the same conditions of testing, was secured at two time points eight months apart, in the same community.

Thirdly, it was desired to study the individual's extent of social contacts so as to define the range of individuals from whom selection was possible, in order to discover whether the individual's *social* projection in initiating or maintaining contacts with others is related, or not, to his *emotional* projection in relating himself to others by choice or rejection.

The Problem

The problem of this study is an analysis of personal interrelationships (of choice and rejection) within a population in order to discover the nature of individual differences in this area.

Questions that may be proposed for investigation are as follows:

1. With how many other persons does an individual initiate or maintain contact (however slight), *i.e.*, how *socially expansive* is he?
2. Among the persons with whom he comes into contact, how many does he want by positive choice to include in his life situation, *i.e.*, how *emotionally expansive* is he?
3. Are these two expressions of the individual related?
4. Is the number of persons chosen at one time related, or not, to the number of persons chosen by the same individual at a later time?
5. Are the reactions of other individuals toward him a more stable phenomenon than the individual's reactions toward others?
6. What is the nature and extent of mutual attractions and rejections?
7. Do negative reactions surpass, equal, or fall below reactions of positive choice?

The Experiment

The laboratory of the present research was the New York State Training School for Girls. For this purpose, the institution was an ideal laboratory: a closed community comprising over 400 individuals. As the field of study is a closed community, the subjects are limited in the forming of relationships to other individuals of the population and consequently the situation is uniform for all in this respect. Further, the advantage of so large a population is that it provides a range in personalities so great as to be stimulating to the socially most withdrawn individuals and likewise to the socially most expansive individuals.

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* In the present report, results on preference levels will be omitted; see 4.

The population consists of girls committed by the Children's Courts of New York and represents a cross section of the socially and economically under-privileged of the state's population as a whole. To be admitted, the girl must be over twelve and under sixteen years of age, of normal intelligence, and appear capable of profiting from the care provided by the institution.* Psychotic cases may not be committed or retained. Thus the institution's population does not deviate too radically from the general population. In the main the precipitating cause of commitment is precocious manifestation of interest in the opposite sex. The institution is expected to provide the girl with academic and vocational training and to place her, usually by the age of seventeen, in a position in which she earns sufficient to be self-supporting, especially in instances where her own home is unsuitable.

The Method.—Preceded by a general discussion in which a plan was agreed upon (by subjects and experimenter), the verbatim directions of the sociometric test were as follows:

> You will notice that your paper is divided into eight squares or boxes. In the first "Yes" box, marked "Live with," write the names of whatever girls there are anywhere on the campus or in your own house whom you would prefer to live with. In the "No" box of "Live with," write the names of whatever girls there are anywhere on the campus or in your own house whom you would prefer not to live with.
>
> Do the same for the "Work with" boxes. Those you want to work with place in the "Yes" box for work. Then those you would prefer not to work with, place in the "No" box for work.
>
> Next, do your "Recreation or leisure" and then, your "Study or school" boxes, having in mind the same instructions.
>
> Remember that we decided each person should write only as few or as many names as there are girls whom she feels definitely "Yes" or "No" toward for each of the four groupings—living, working, recreational leisure, studying—and that if you want the same girl *for more than* one thing, you must put her name in the boxes for those things.
>
> Also, in regard to those individuals whom it doesn't make any difference to you whether they are in the group or not, simply omit their names. The "No" boxes should contain only the names of those, *if any*, whom you definitely *don't* want in your group for the particular functions or function, which it happens to be. The "Yes" boxes should contain only the names of those, *if any*, whom you definitely *do* want in your group for the particular functions or function, which it happens to be.
>
> If you definitely prefer not to work with a certain person, and that is the only thing you prefer not to do with her, her name would be only in the "No" box for work and not in any other "No" boxes. If you definitely want to live with her, but not to work with her, and don't care one way or another about whether she is in your "Play and leisure" group or your "Study" group, then you would put her name in the "Yes" box for "Live with" and the "No" box for "Work with" and nowhere else.
>
> You may use, in addition, any other functions which you need if the four we named do not fit; in that case, name the criterion yourself; don't leave it undetermined.
>
> Do not ask each other any questions, as even mentioning a name may suggest it to another girl or might "give away" what names you are writing. We decided the papers should be completely confidential.
>
> (Directions were then given for indicating whatever preference levels the individual considered her "Yes" and

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[*] Actually the courts on occasion commit individuals who do not meet these requirements.

"No" names to have; the directions will be omitted here as the present study will not include their analysis.)

The second technique used, which also was preceded by a discussion leading to its "definition," was a social contact listing or "test." The verbatim directions were as follows:

> We will now turn to the other points we discussed: How many contacts each of us has throughout the campus and the number of times we have used our contacts. You remember we agreed that a contact was "another person you take the trouble to speak to, not including persons who may have spoken to you and to whom you therefore *had* to reply; the persons whom you had to reply to are contacts only if at another time you again spoke to them when you didn't have to."
>
> In the widest column on your paper list all your contacts as we have defined them. Do not include any girls living in your cottage, as of course it is understood that they are contacts. But *do* include the names you have written on the paper you have just handed in. We shall need to check certain things for these names. Notice that to the right of the widest column are four narrow columns, headed 1–2, 3–5, 6–10, and 11 or over. These columns we can let indicate the number of times you have spoken on your own initiative to the particular contact. Put a check mark in whichever column is correct for the number of times you have spoken to the person. (Experimenter explained how headings were arrived at by having done the experiment herself.) You will find it is fairly easy to recall which heading is just about right.
>
> You will notice also that there is a column marked "X" to the left of the widest column. You may put an "X" in the column with this heading next to any names in your list of contacts which represent persons you would like to talk to many more times. If it doesn't make any difference to you whether you ever get a chance to talk again to some of your contacts, do not put anything in the "X" column opposite their names. Thus, your paper will tell exactly which persons each of you would like to have further opportunity to contact. Remember you are to put an "X" only beside the names of persons whom you care very much about knowing better. If there are no such persons, other than the ones you have chosen, you will have "X" only beside their names.

The first tests were given during the last week of December, 1937. The test population included all individuals (443) comprising the population of the school as of Jan. 1, 1938. The period of Christmas vacation was selected for the testing because during this period academic school and most vocational assignments were suspended. Thus less than usual opportunity existed for discussion to take place between tested and untested individuals before all had been tested. Retests were given during the first week of September, 1938. The retest population included all individuals (457) comprising the population as of Sept. 3, 1938.

The spacing of the retesting at an interval 8 months distant from the original testing was selected (*a*) because it was considered sufficient to allow the presence or absence of characteristic trends to be shown in the individual's structure of interpersonal relations through a comparison of the data of both tests, and (*b*) because it was desired for the purpose of the research that the majority of the members comprising the population at the time of the first test be present for the retest.

The methods used in the first testing were duplicated in the second, except for one omission. In the retesting, the social-contact "range" or listing was not taken. Its repetition did not appear necessary to the present study, the results on its initial use being sufficient for the purpose. The period used for the retesting was selected, in addition to the reasons stated above, because it came just prior to the opening of academic school and the starting of new vocational assignments, incurring new contacts that might disproportionately have affected the choice process.

Subjects of the Research.—The analysis will be concerned with a portion of the subjects living in the school, even though the entire population present at either time were the subjects of the testing on both occasions, as the primary purpose of the study is to compare individuals who were present on both occasions.

The population at the time of Test I comprised 443 individuals, of whom 320 were white and 123 Negro girls. To increase uniformity of conditions, only white girls living in cottage units are the subjects of the analysis, thus making the living-together groups similar. White girls living in other than regular cottage units (as hospital or farm units) are excluded also because their opportunities for contact with other individuals varied greatly from those of the general population.

The white girls living the regular cottage life of the community at the time of Test I numbered 236 and were housed in ten cottages. Eight months later, of the 236, there remained 133 individuals living in the *same* cottage units as formerly. The analysis is primarily concerned with the 133 individuals who were present for both test and retest and occupied on both occasions the same housing unit. This group of 133 will be designated as A_{I} when reference is made to data from its first test, and as A_{II} when reference is made to data from its retest. Complete data on choice and rejection are presented for A_{I} and A_{II}.

For the purpose of examining the positive-choice process as it operates in a larger group, the positive-choice data on the 236 white subjects are also presented.* This group of 236 subjects will be designated as Group AB.

The population as a totality enters into the analysis, it should be recalled, as the expression of choice and rejection by the subjects may involve any member of the whole population and the subjects may be chosen or rejected by any member of the whole population as well as by one another.

Data of the Analysis.—To examine the choice process under conditions which were uniform for all subjects, the data used in the analysis include all choices and rejections given either on the criterion of *living* or on the criterion of *working*. The importance of the two criteria applies to each member of the community. No individual lived apart from a group of other individuals and likewise no individual worked at a vocation in which a number of other individuals were not also occupied. On the other hand, all the subjects did not have academic studies in common with others, and considerable freedom in the use of leisure and time for recreational activities removes the possibility of using the results on these criteria as comparable from one individual to another. The "undetermined" criterion was only occasionally employed.

Note on Reliability.—A retest of one housing unit was made after a 4-day interval; this gave a reliability coefficient of .96 for positive choice and .93 for rejection, based on the gross number of reactions given by the individual *toward others* on the two occasions. The high reliability coefficient obtained by the method of immediate retest may be indicative only of the slowness with which individuals change in their extent of choice and rejection of others. The present problem is one of examining how stable is such behavior, for the same individual, at two time points 8 months distant. The consistency of the individual's reactions, as revealed by the method constructed here, can be estimated from review of the total findings. Previous research presents no evidence on this question, as the extent to which the subject could choose others was allotted in advance.

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* As these data confirm the findings on positive choice on the 133 subjects (who form part of the 236), it was not considered necessary to analyze the data on rejection for the 236 subjects, and their positive choices only are therefore included.

As previously employed, *viz.*, allowing the subject a specified number of choices and using one criterion, the sociometric test was found by Newstetter, Feldstein, and Newcomb to have an average reliability of .95 (6, page 35) based on data given on 4 successive weeks with a five-choice allowance on one criterion (tent mates in summer camps). Zeleny found, at the college level (7, page 804) also using five choices and one criterion (membership in a discussion group), reliability coefficients ranging from .93 to .95 on readministering such a sociometric test on successive days. The coefficients just quoted are based on the extent to which the subject is chosen by others on one occasion and on another occasion (sometimes on several occasions); they thus relate to the choice position the individual *receives from others*. Such evidence is an important indication that the "choice status" of the individual does not rapidly change.

The more stringent comparison which the present study makes, by use of unlimited choice and a much longer retest interval, reveals that, even under these conditions, there is a fairly high correlation (see page 538) between the individual's choice status on different occasions when he remains in the same community.*

Methodological Considerations.—In the present research, the extent to which the individual chooses others is a measure of his *emotional expansiveness* toward others; the extent to which he rejects others is a measure of his *rejection* of others. It must be immediately obvious that the line of demarcation here taken to mark off the number of individuals toward whom the individual reacts by positive choice or by negative choice does not rigidly divide off those toward whom his reaction has come to have emotional components to some degree from those toward whom such reaction is nonexistent. The problem is clearly not this simple. It is doubtful if two persons can meet without some emotional reaction, however slight, taking place between them. But in most passing contacts, the reaction is of so little concern to either individual (quite aside from its slightness) that they may be hardly aware of any reaction. The line of demarcation between choice or rejection and nonreaction on a choice-or-rejection basis divides off those for whom the individual has a positive emotional reaction of choice or a negative emotional reaction of rejection from those toward whom he has neither reaction, when the possibility is open to him to express preferences which may be used to maintain or alter his personal situation in respect to being associated with others.

The persons who are chosen or rejected are selected for choice or rejection by the individual out of the range of contacts he has established with others. Since many of the persons in the individual's social-contact range may not become either chosen or rejected by him, and yet the individual is socially expansive toward them as shown by his continuing to maintain contact with them, it is convenient and appropriate to designate the extent of his social-contact range as a measure of his *social expansiveness.*[*] The extent of all contacts, initiated or continued upon the initiative of the individual, can thus be differentiated from the number of contacts toward whom the individual comes to be emotionally drawn to the extent of choosing or repelled to the extent of rejecting. Social expansiveness and emotional expansiveness can then be studied as two distinct phenomena in interpersonal relations, two phenomena which may or may not show correspondence in their expression.

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* The concepts of validity and reliability do not have the same application here as in the field of intelligence testing. The test here is not intended as an indirect measure of other behavior. It is a sample of the actual behavior studied and *as such* is in itself directly meaningful and need not be validated by relating it to an external criterion. It also need not be consistent from one application to another, since it is not required to be related to a supposedly unchanging criterion (*e.g.*, as intelligence is supposedly related to an unchanging criterion in the nervous system). The present research, however, reveals the individual's behavior in choice to show considerable stability.

In reporting the findings of this research, the term "social expansiveness" will always be used to designate the social-contact range of the subject, but "expansiveness" will frequently be used, for brevity, instead of the term "emotional expansiveness" in referring to the number of individuals chosen by the subject.

Results

The results present an analysis of the number of different individuals reacted to positively (chosen) or negatively (rejected) by the subjects (Table 1), the number of different individuals reacting positively or negatively to the subjects (Table 1), the number of different individuals who reciprocate the subjects' choice or rejection (Table 1), the subject's social-contact range (Table 2), the product-moment coefficients of correlation (Table 3) between different aspects of the above findings, and their consistency from Test I to Test II (Table 3).

For purposes of comparison of the results on Test I with the results on Test II, the main analysis is concerned with the group of 133 subjects present for both tests (Group A_I and Group A_II according as reference is made to the results on Test I or Test II). Additional data from an analysis of the results on positive choice for a group of 236 subjects is to be designated as AB_I, of whom A_I formed a part.

Length of Residence and Positive Choice.—The positive expression of choice by Group AB_I shows a median of 7.60 individuals chosen by the subject; for Group A_I the median number is 7.52 (see Table 1). Both AB_I and A_I as a group had been in the community for a considerable period by the time of Test I: the median length of stay was 14.3 months for AB_I, and 11.7 months for A_I; the range in both instances extended from 1 month (15 days or over) to over 3 years. Increase in length of time[†] individuals are together does not show for the test population any correlation with the number of individuals for whom they express positive choice ($r = .06$ for both A_I and A_II). If finer units of a few days up to 4 weeks were to be studied (and all the individuals were new to one another), it might be that extent of choice would be found to be related to length of time individuals are in contact with one another. There are only a few such subjects in the present study. Thirteen individuals in Group A had been in the community from 15 days up to 3 months. Four of these subjects, who were respectively 15, 16, 16, and 17 days resident, chose respectively 5, 3, 10, and 6 individuals. Six subjects who were 2 months resident chose from 6 to 11, and three subjects who were 3 months in the community chose from 5 to 10 individuals. The number of individuals chosen by the subjects as a whole is equally varied; inspection of the subjects' use of choice at any level of length of stay shows the median to fall at practically the same point as that of test population A (or of AB_I) as a whole. Thus there is no evidence that length of time individuals are together will either increase or decrease the extent of their positive choice for one another. It appears that on the average individuals early in their stay in a community show an extent of positive emotional expansiveness which does not increase appreciably no matter how long they remain together. The subject who is relatively more or relatively less expansive toward others will react to them more or less independently of the length of time he is in association with them as far as this population goes.

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[*] This measure should not be confused with the measure defined in previous research as the individual's "acquaintance volume" (3, p. 130; 5, p. 138). The latter cannot be used as a measure of the individual's social expansiveness since it is comprised of persons toward whom the individual may show no initiative or interest and who have come to be "acquaintances" through *their* initiative toward him.

[†] For further findings on length of residence and other factors in relation to the choice process, see 4, Chaps. VII and VIII.

TABLE 1.—NUMBER OF CHOICES AND REJECTIONS MADE ON TEST I AND TEST II*

	Number of choices made by S.		Number of rejections made by S.		Number of times S. is chosen		Number of times S. is rejected	
	Test I	Test II	Test I	Test II	Test I	Test II	Test I	Test II
Median........	7.52	8.16	4.20	4.16	6.32	9.00	2.41	3.06
Mean..........	7.86	8.39	4.41	4.29	7.21	9.40	3.71	4.23
S.D...........	2.99	3.45	2.43	2.39	5.14	5.62	4.06	3.99
$\frac{M_{II} - M_I}{\sigma D}$......	1.65		−0.50		5.48		1.86	

	Number of reciprocations of choice by S.		Number of reciprocations of rejection by S.		Sum of choices and rejections by S.		Sum of choices and rejections of S.	
	Test I	Test II	Test I	Test II	Test I	Test II	Test I	Test II
Median........	2.02	2.97	0.30	0.57	12.11	12.82	10.54	13.61
Mean..........	2.47	3.43	0.68	1.00	12.27	12.68	10.92	13.62
S.D...........	2.25	2.40	1.17	1.33	3.92	4.69	5.39	5.00
$\frac{M_{II} - M_I}{\sigma D}$......	3.69		3.20		0.91		5.87	

* Data for Group A, 133 subjects. Choices and rejections made with reference to total population, 443, Test I, and 457, Test II. Criteria for choosing and rejecting, living together, working together.

Positive Choice by and toward Subject.—The positive expansiveness of others toward the subject, as measured by the number of individuals choosing the subject, shows for AB_I a slight correlation with the positive expansiveness of the subject toward others, as measured by the number of individuals he chooses. The r is .20 and is significant at the .01 level of chance. The correla-

TABLE 2.—SOCIAL-CONTACT RANGE*

	Group AB_I	Group A_I
Number of subjects....	236	133
Median...............	45.8	44.5
Mean.................	50.5	47.7
S.D..................	32.9	28.9

* Number of individuals with whom contact is maintained, exclusive of those occupying the same housing unit with the subject.

tion is somewhat higher and similarly significant for A_{I}, the r being .30; but for A_{II} the correlation is not significantly different from zero, the r being .12. Thus the small relationship between the individual's positive expression of choice for others and of others' for him tends to disappear by the time of Test II. On the other hand, the extent to which the individual's choice of others is reciprocated by them correlates at both periods fairly highly with the extent of his choice for others: r = .51 for AB, .32 for A_{I} and .43 for

TABLE 3.—CORRELATIONS

	Test group	N	r	Critical ratio: Zr/σ_z
Number chosen by subject and number choosing him	AB_{I}	236	.20	3.12
	A_{I}	133	.30	3.44
	A_{II}	133	.12	1.34
Number chosen by subject and number reciprocating him	AB_{I}	236	.51	8.66
	A_{I}	133	.32	3.68
	A_{II}	133	.43	5.11
Number choosing subject and number reciprocating him	AB_{I}	222*	.59	9.68
	A_{I}	124*	.70	9.64
	A_{II}	129*	.67	9.01
Number rejected by subject and number rejecting him	A_{I}	133	.001	
	A_{II}	133	.01	
Number rejected by subject and number mutually rejecting him	A_{I}	127†	.20	2.25
	A_{II}	124†	.20	2.25
Number rejecting subject and number mutally rejecting him	A_{I}	108†	.73	9.29
	A_{II}	115†	.62	8.06
Number chosen by subject and number rejected by subject	A_{I}	133	.03	
	A_{II}	133	.26	2.96
Number choosing subject and number rejecting him	A_{I}	133	−.33	3.81
	A_{II}	133	−.50	6.10
Number chosen by subject on Test I and number chosen by him on Test II	......	133	.37	4.32
Number choosing subject on Test I and number choosing him on Test II	......	133	.65	8.61
Number rejected by subject on Test I and number rejected by him on Test II	......	133	.27	3.08
Number rejecting subject on Test I and number rejecting him on Test II	......	133	.66	8.81
Number reciprocating choice by subject on Test I and number reciprocating choice by him on Test II	......	133	.12	1.34
Number reciprocating rejection (mutual rejection) by subject on Test I and number reciprocating rejection by him on Test II	......	133	.33	3.81
Number chosen by subject and subject's contact range (the latter taken at the time of Test I only).	AB_{I}	236	.18	2.80
	A_{I}	133	.22	2.48
	A_{II}	133	.06	
Number choosing subject and subject's contact range	AB_{I}	236	.40	6.52
	A_{I}	133	.29	3.32
	A_{II}	133	.09	
Number reciprocating choice by subject and subject's contact range.	AB_{I}	236	.22	3.44
	A_{I}	133	.22	2.48
Number rejected by subject and subject's contact range	A_{I}	133	.16	1.78
Number rejecting subject and subject's contact range	A_{I}	133	.004	
Number reciprocating rejection by subject (mutual rejection) and subject's contact range	A_{I}	133	.02	
Sum of number chosen and number rejected by subject and sum of number choosing and number rejecting him.	A_{I}	133	.21	2.37
	A_{II}	133	.09	
Sum of number chosen and number rejected by subject on Test I and the similar sum on Test II	......	133	.29	3.32
Sum of number choosing and number rejecting subject on Test I and the similar sum on Test II	......	133	.45	5.39
Sum of number chosen and number rejected by subject on Test I and subject's contact range at time of Test I	......	133	.26	2.96
Sum of number chosen and number rejected by subject on Test II and subject's contact range at time of Test I	......	133	−.005	
Sum of number choosing and number rejecting subject on Test I and subject's contact range at time of Test I	......	133	.27	3.08
Sum of number choosing and number rejecting subject on Test II and subject's contact range at time of Test I	......	133	.06	

* In calculation of the coefficient of correlation (product-moment) the unchosen individuals are omitted, as they could not have reciprocations if they received no choices.

† In calculation of the coefficient of correlation the individuals who do not reject are omitted, as they could not have reciprocated rejections. Likewise, in the correlation of number rejecting the subject with number mutually rejecting him, the unrejected individuals are omitted so as not to bolster the correlation.

A_{II}. Further, the extent to which the individual's choice of others is reciprocated correlates still more highly with the extent to which he is chosen by others: $r = .59$ for AB_I, .70 for A_I and .67 for A_{II}.

Thus whereas there is shown only a slight relationship between the positive expansiveness of the subject and the positive expansiveness of others to him (a relationship which is not maintained after the length of time in the same community has been extended), the degree to which the subject's choice of others is reciprocated by them is appreciably related, not only to the degree of his expansiveness but also to the degree of others' expansiveness toward him. The subject who is relatively more expansive than others appears as a subject who more likely than not is expansive toward some of those who respond to him, or better able than other subjects to gain reciprocation from those to whom he responds. And the subject to whom the population shows itself to be relatively more expansive is a subject who chooses in the direction of those who are drawn to him; or, in other words, the facility to form mutual relationships of choice is one attribute of the individual toward whom others show relatively great emotional expansiveness as expressed in choice for him. The subject who chooses relatively many or who is chosen by relatively many is hardly ever an individual who is not himself drawn to some of the persons who are drawn to him. While the individual cannot have a reciprocated response without himself making a response, it is notable that the sheer number of responses of attraction to others (as well as the sheer number of others' responses of attraction to the individual) contributes positively to the likelihood of reciprocation.

Rejection by and toward Subject.—The negative aspect of choice shows similar findings. There is no correlation found between the extent to which the subject rejects others and the extent to which he is himself rejected by others. For A, $r = .00$ on both Test I and Test II. On the other hand, the correlation is significant, at the .05 level of chance, between the extent to which the subject rejects others and the extent of mutual rejections between himself and others. For both A_I and A_{II}, $r = .20$ (critical ratio 2.25). The extent to which the subject is rejected by others and the extent of mutual rejections between the subject and others correlates as highly as the positive-choice counterpart of this relation. For A_I, $r = .73$; for A_{II}, .62. Thus the subject who is rejected to a relatively great extent appears as a subject who rejects more likely than not some of the individuals who are rejecting him; or, the facility to form mutual relationships of rejection between himself and others appears as an attribute of the individual toward whom others show relatively greater rejection. The individual who is much rejected is not likely to be an individual who does not return rejection to some of the very persons who are rejecting him. The sheer number of responses of rejection he arouses from others appears to contribute positively to the likelihood of his reciprocating them with rejection.

Relation between Positive Choice and Rejection.—The extent of the positive expansiveness of the subject toward others shows no correlation with the extent of his rejection of others on Test I: $r = .03$ for A_I. But a slight positive correlation which is significant at the .01 level of chance appears on Test II: $r = .26$ for A_{II}. Hence, the number of individuals the subject rejects and the number he chooses are correlated to a small degree by the time of Test II. On the other hand, the number of individuals who reject the subject and the number who choose him are inversely related for A_I, with r at $-.33$, and still more highly inversely related for A_{II}, with r at $-.50$. It thus appears that the greater the extent of positive expansiveness toward the individual the smaller is the extent to which he is rejected.

Consistency of Choice and Rejection. *Total Reactions as a Sum.*—Whereas the positive choice expression of the individual does not, as reported above, show any correlation until Test II with his negative-choice expression of rejection, the total expression of the individual as a *sum* of both his positive- and negative-choice expressions on Test I shows a positive correlation of .29 with his total expression on Test II and is significant at the .01 level. In view of this finding it is of further interest that the sum of the number of individuals choosing or rejecting the subject on Test I and on Test II correlate at .45.

Positive and Negative Reactions, Singly.—The significance of the correlations between total reaction by the subject or toward the subject becomes further apparent by inspection of the consistency of his positive or negative reaction and the consistency of the positive or negative reaction to him by others. Between Test I and Test II the positive expression of the subject for others correlates at .37; between Test I and Test II the negative expression of rejection of others by the subject correlates at .27, and both coefficients are above the .01 level of significance. The individual subject is thus shown to maintain to some extent his relative position in respect to other subjects in the expression of choice and in the expression of rejection. It is notable, too, that the critical ratio of the difference between the correlated means on the two tests are: for positive choice by the subject, 1.65; and for negative choice by the subject, −.50 (see Table 1). Hence the mean change or typical change in either expression from Test I to Test II is nonsignificant. While the individual subjects in their expression show increase and decrease on Test II in a manner that is not highly consistent with their expression on Test I (consequently resulting in low *r*'s), the average change in performance of the individuals as a group from Test I to Test II is not significantly different from zero. The individual differences in the amount of change* accordingly show the median and mean of their frequency distribution to fall at zero both for positive choice and for negative choice.

The positive expressions of choice for the subject on Test I and Test II correlate at .65; the negative expressions of rejection for the subject on Test I and Test II correlate at .66. In both instances the individual subject who elicits relatively more or relatively less reaction, whether positive or negative, appears to continue to elicit relatively the same amount. There is evident some agreement (some consensus) from one time to a later time. Whatever has initially brought about his position in respect to others continues to manifest itself in this or other forms definitely acceptable or inacceptable to others as shown by the consistency of their reaction to him. But whereas the subjects as a group do not show significant change from Test I to Test II, 8 months later, by either increase or decrease, in the extent of the number of individuals they choose or in the extent of the number they reject, there is found a significant change in the number of individuals who choose them from Test I to Test II (C.R. = 5.48) and no significant change in the number of individuals who reject them from Test I to Test II (C.R. = 1.86). Thus, whether or not a significant change takes place in the gross amount of reaction to the test group of subjects, the subject is found to maintain to a high degree the relative position accorded him by the general population from one time to a time 8 months later.

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* For difference between number chosen by the individual on Test I and Test II, mean = 0.53 and median = 0.31. For difference between number rejected on Test I and Test II, mean = −0.04 and median = −0.12.

Implications of Consistencies.—The findings up to this point suggest a conclusion that the individual has a characteristic value in respect to the amount of positive and negative reaction he arouses from other individuals. This individual characteristic may be called his "valence." On the other hand, the extent of his own capacity to exercise choice and rejection is not limitless or randomly variable: it shows a definable range, a range that may be called his "*emotional repertoire*" (for responding by choice or rejection) in expansiveness to others, an attribute that may be seen as a relatively permanent attribute.

The findings indicate a third conclusion. The individual is found not to react by positive choice only: almost universally he reacts by both choosing and rejecting. Nor is he reacted to by positive choice only: he is both chosen and rejected, also scarcely without exception. And the longer the period of interpersonal experience he spends with others, the more particularized and definite appears the picture of choice and rejection as a single process in which a separating out of positive choice from negative choice distorts the total process. Positive choice as it is expressed by the individual or as it is focused upon him by others and rejection as it is expressed by the individual or as it is focused upon him by others are seen not as being two separate and distinct aspects of *a* choice process, but as forming *one* choice process in which the negative and positive aspects of choice bear particular relationships to each other—a single process in which the positive and negative aspects of choice do not operate independently of each other but within which rejection is a partial aspect and positive choice likewise but a partial aspect.

Proportion of Positive to Negative Choice.—The mean number of positive choices expressed by the subjects in Group *A* for different individuals on Test I is 7.86 and on Test II, 8.39. The mean number of rejections expressed by the subjects for different individuals on Test I is 4.41 and on Test II, 4.29. Thus on both occasions the positive expression for participating with others is practically twice as great as the expression of rejection. Since *N* is the same on both occasions, the same relation holds for the gross emotional expression.*

The mean number of persons positively reciprocating the subject's choice to them is 2.47 on Test 1 and 3.43 on Test II. Thus 31 per cent of the individuals chosen on Test I and 41 per cent of the individuals chosen on Test II reciprocate the subject's positive choice. The mean number of individuals mutually rejecting the subject who has rejected them is 0.68 on Test I and 1.00 on Test II, or 16 per cent on Test I and 23 per cent on Test II. The increase of 10 per cent in positive reciprocation is accompanied by an increase of 7 per cent in negative reciprocation. The evidence further supports the finding that positive and negative responses have a concomitant development. The number of structures of mutual positive choice is three times as frequent on Test I as the number of structures of mutual rejection (2.47:0.68), and the positive aspect of mutuality continues to exceed in volume the negative aspect of mutuality (3.43:1.00) as the latter increases after contact of longer duration among the members of the test population on Test II.

Mutuality: Positive and Negative.—The mean increase from Test I to Test II of both positive reciprocation and negative reciprocation is significant in both instances (C.R. 3.69 and 3.20 respectively). The number of individuals who on Test I and on Test II reciprocate rejection by the subject correlates at .33, but the number of individuals who reciprocate positive choice by the subject shows an insignificant correlation, the *r* being .12. The lack of significant correlation in the latter instance is found to be a favorable fact in the choice process rather than the contrary, because it does not reflect a lack of "better" performance: it reflects irregularly better performance in general. The individual's increase in capacity to form positive mutual relationships shows a sharp rise unpredictably greater than the past performance for some individuals: the 21 subjects who on Test I had no reciprocated choices on Test II show a range from 0 to 8 in number of individuals reciprocating them. Of the twenty-one subjects, four are reciprocated by 1, four by 2, three by 3, one by 4, one by 5, one by 6, and one by 8, with only six chosen by no one whom they have chosen. The increase is equally irregular for the thirty-three subjects who on Test I were mutually chosen by only 1 individual: on Test II, two of them are mutually chosen by no one, nine by 1, nine by 2, two by 3, two by 4, five by 5, two by 6, one by 7, and one by 10. On the other hand, subjects who on Test I were reciprocally chosen by from 8 to 15 show a decrease; they are mutually chosen on Test II by from 6 to 8, a retrenchment that may reflect a withdrawal on their own part from the demands made upon them by others, causing them not to choose others to the same extent as formerly, so that there are in consequence fewer reciprocal choices between themselves and other persons.

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* For gross figures, multiply mean by 133.

It also appears that positive reciprocation between himself and others is difficult for the individual to develop and he shows himself slow in achieving his full capacity in this respect. But when he begins to meet with success, he seems to have a rapid rather than gradual success, quickly gaining within a comparatively short time reciprocation by a relatively large number of persons. It is understandable that at the start of an individual's stay in a community, the initial reciprocation he gets would be slow to come about. It appears abundantly evident from this research that structure in general does not suddenly alter radically in the test community; it is more marked by stability than by flux, in spite of the fact that relatively many new members are entering and "old" members are leaving the population. The individual enters a community the members of which have their emotional expansiveness already channeled to a large extent. Since the capacity for emotional expansiveness on the part of any individual appears from the findings not to be limitless but generally to range within a relatively definable repertoire of expression in choice for others, the individual's task is frequently that of rechanneling choice away from persons who are receiving it from the person or persons that he wants to be attracted to him.

In contrast to positive mutual reactions, the mutual rejections correlate significantly between Test I and Test II, since the rise in reciprocated rejection is more regular and gradual. The individual does not "jump" from one or two mutual rejections to so unpredictably a larger number, as is the case in positive mutual structures once the subject begins to achieve them. Also the "retrenchment" in number of individuals chosen by the much-chosen subject is not found in respect to number of individuals rejected for the very much rejected subject: his performance is in the opposite direction, rejecting more rather than less on Test II. Where there is decline in number of reciprocated rejections from Test I to Test II, this likewise is in general a gradual decline.

Social Expansiveness.—The field of other individuals out of which the subject chooses and rejects, although it was for each the entire population of the community, varied greatly from subject to subject according to the initiative he displayed in contacting and maintaining contacts with others who may have contacted him. The actual reference-base-for-choice (or rejection) can thus be considered the social-contact range of the individual. The number of individuals the subject is in contact with at the time of Test I shows a median of 45.8 individuals for AB and 44.5 for A. Thus social expansiveness, as defined by the number of individuals in the social-contact range, is on the average over five times as many as the subject chooses, about ten times as many as he rejects, and about eight times as many as he reacts to on a basis of either positive or negative choice.

The extent of the subject's social-contact range shows a correlation of .34 for Group A with the subject's length of stay in the community and is significant at the .01 level of chance. Thus while the subject's emotional expansiveness was found to bear no relation to his length of stay in the community, his social expansiveness shows a positive relationship to the length of his residence.

The subject's contact range shows a slight relationship to the number of individuals chosen by the subject in AB: $r = .18$ and is significant at the .01 level. A similarly slight relationship is shown for A_I: $r = .22$, just less than significant at the .01 level (C.R. = 2.48). There is also found a correlation of .22 for both groups of subjects between social-contact range and number of individuals reciprocating positive choice by the subject. The highest correlation appears, however, for both groups between contact range and number of individuals expressing positive choice for the subject: $r = .40$ for AB and .29 for A_I. There is found no correlation differing significantly from zero for the subject's contact range and either number of individuals rejected by him or rejecting him or number mutually rejecting the subject (see Table 3). But the sum of individuals reacted to by the subject, by choice or rejection, and the sum of individuals reacting positively or negatively to the subject correlate with the subject's contact range at .26 and .27 respectively.

Thus there is indicated a very low but positive correlation between the individual's social expansiveness and the extent to which he shows emotional expansiveness in choice of others or the extent to which emotional expansiveness is expressed in choice for him. But his rejection of others or others' rejection of him appears unrelated to his social expansiveness in contacting others. The sum of other individuals to whom he reacts or who react to him positively or negatively, the total impress he makes upon others or others make upon him, is significantly related, although to only a very small degree, to his social expansiveness.

The social expansiveness of the subject as found on Test I shows no correlation whatever with either choice or rejection, or both, by or toward the subject on Test II. Thus the individual's social expansiveness at one time shows no relation to emotional expansiveness measured at a later time.

The individual's contact range shows a gradual progressive average increase particularly up to 9 months of his residence, after which length of time the correlation to be noted is much smaller and hardly significant. In view of the fact that in exercise of positive choice toward others the individual shows no such gradual increase but instead, as far as the present findings indicate, is drawn to choose others to as great an extent from the beginning of his stay in a community as he is to choose later after he has been resident for a comparatively much longer period, it may be concluded that social expansiveness differs essentially from emotional expansiveness as each is defined in this research. Whatever enters into the subject's spontaneously choosing others operates, it appears, from the start of his contact with others to as large an extent as it does later, when the individual's range of contacts has provided him with a larger field for choice. It may be conjectured that social expansiveness is an expression more peripheral to the needs of the individual than emotional expansiveness.* The individual is revealed as having a limited emotional range or "repertoire" for reacting to others by positive choice or by rejection and this repertoire shows only a very slight relation to his social projection in making contact with others.

Summary

The individual differences which this research has disclosed in the social and emotional projection of individuals toward one another provide not only an insight into the nature of the choice process as it operates between individuals, but also an insight into the inner dynamics of personality tapped by the choice process. The social expression of the individual, as measured by his initiative in seeking and maintaining contacts with others, is found to differ essentially from the individual's emotional expression, as measured by his choice behavior. The individual is revealed as having a *limited emotional range* or *repertoire* for reacting to others by positive choice or by rejection, and this emotional repertoire shows only a very slight relation to his social projection in contact with others.

The individual in his exercise of choice and rejection of others does not significantly depart from his characteristic range according to the manner in which the situation in which he is is structured in respect to him (by the extent of others' choice or rejection of him). On the contrary, the individual's capacity for emotional expansiveness appears as a relatively constant characteristic which is not so elastic that he can readily extend or reduce its expression according as others "want" or "don't want" him, are receptive to him, or are inexpansive to him. The range of the individual's emotional reactions appears *stable within his repertoire of expression*. Whether the structure of the situation in which he finds himself invites choice from him or rebuffs choice by him, he appears impelled to find an outlet in expression for others which is determined more by his own need for and response to others than by theirs for him. The individual's choice behavior, *in contrast to his social* expansiveness, appears as an expression of needs which are, so to speak, so "central" to his personality that he must strive to fulfill them whether or not the possibility of fulfilling them is at hand or not. The extent of negative or positive "press" exerted by others toward the individual appears not to affect the extent of his need for others, as measured by the extent of his own negative or positive choice behavior toward others.

The capacity of the individual for responding to other persons as persons must be considered one of the most fundamental facts in the psychology of personality.

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CHAPTER XXXI

EVALUATIONS OF ADOLESCENT PERSONALITY BY ADOLESCENTS*

CAROLINE McCANN TRYON

Introduction: The Experimental Background

Purpose of the Study.—The purpose of this study is to investigate some of the factors involved in the task of maintaining status with one's peers for a group of boys and girls during the junior high school years. Records of reputation with peers were accumulated systematically for this group over a period of time, as part of a larger research project in which various aspects of growth and development were studied.† One of the major sources of information concerning reputation was classmates' opinions of each other collected by means of a verbal portrait-matching technique (Guess Who test); another source was the anecdotal records and ratings made by adult observers on the research staff.

In the early organization of these reputation data it became apparent that different standards of evaluation were operating for adults and children in the formulation of their opinions. Further preliminary examination of the raw scores from the Guess Who test suggested the hypothesis that the children's criteria for judging their peers changed from the beginning to the end of junior high school and that at all grade levels there were different criteria of social prestige for boys and girls. Our task here, therefore, is (*a*) to analyze these children's opinions to determine what are considered by them prestige-lending characteristics and behaviors, and (*b*) to examine differences and similarities between the children's and the adults' opinions.

The analysis will be made separately for boys and for girls at two grade levels; hence there will be four sets of data for comparison.

The Group.—The children who participated in this research project attended Oakland, Calif., public schools. They represent a fair cross section of that total population of comparable grade levels. However, by all available criteria this group was on the average slightly superior to the total Oakland school population of the same grade levels and slightly more homogeneous. There were no Negroes, no Orientals, and no Mexicans in the classes which this group attended.

The group was distributed between two grades, one-half year apart. At the time of the first testing to be considered here, the children were finishing the high sixth and the low seventh grades (tested in May, 1933). They were in nine different classrooms, which ranged between 35 and 45 in population. At this time a child spent all the school hours with this one group, his class. There was a marked tendency for a class group to be together on the playground, too, though there was definite voluntary segregation by sex. At the time of the second testing the children were finishing the high ninth grade (tested in December, 1935, and April, 1936). They had entered a departmentalized school program and the day's class periods were spent by each child with different class groups. During recreation periods the children tended to seek out their friends; there was some voluntary mingling of the two sexes.

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* The data in this chapter were selected from the monograph (1) of the same title. Adapted with permission of Society for Research in Child Development.

† The Growth Study of Adolescents at the University of California Institute of Child Welfare was financed by the University of California, the Laura Spelman Rockefeller Memorial, and the General Education Board. Assistance in the preparation of the materials to be reported in this chapter was furnished by the personnel of the Work Projects Administration Official Projects 65-3-5406 and 465-03-40. The cooperation of the Oakland public schools made possible the testing program and frequent contacts with the boys and girls.

About 75 per cent of the group were common to both testings, or about 260 out of 350 individuals.

Since we shall wish to refer to the four groups continually in later sections, we shall use the following designations: *twelve-year-old boys* and *twelve-year-old girls* (the high-sixth- and low-seventh-grade children); *fifteen-year-old boys* and *fifteen-year-old girls* (the high-ninth-grade children). Table 1 gives further data on the chronological age and exact data on number of cases for these four groups.

TABLE 1.—AGE, GRADE LEVEL, AND NUMBER OF CASES AT THE TWO TESTINGS

Group	Date of test	Grade	Age, years			N	
			Mean	S.D.	Range for 95 per cent of group	Girls	Boys
12-year-olds....	May, 1933	*H*6 and *L*7	12.1	0.5	From 11.1 to 13.1	169	170
15-year-olds....	December, 1935 April, 1936	*H*9	14.9	0.5	From 13.9 to 15.9	181	169

The Opinion "Test": Its Form and Content, Scoring, and Administration. *The Form and Content.*—The test booklet contained a series of 40 verbal portraits, each one followed by a blank space in which the children were directed to write the names of classmates whom they thought to be like the description. They were reminded that "several people may fit one picture—the same person may be mentioned for more than one word picture—you may skip any word picture if you cannot think of anyone to match it."

Two word pictures were used to describe the extremes of each of 20 characteristics or traits; *e.g.*, the following items described the variable* we called "restless":

1. Here is someone who finds it hard to sit still in class; he (or she) moves around in his (or her) seat or gets up and walks around.
2. Here is someone who can work quietly without moving around in his (or her) seat.

For convenience in referring to these 20 item pairs, descriptive words or phrases were assigned and these were even more briefly symbolized by a letter for use in charts and tables.

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* The terms "trait," "characteristic," and "variable" have been used interchangeably throughout this chapter. They simply refer to one or another of the pairs of word pictures.

The following list of names and symbols for these item pairs is presented in the order in which the items appeared in the test booklet:

R—Restless—Quiet.
T—Talkative—Silent.
V—Active in Games—Sedentary.
J—Humor about Jokes—Humorless.
K—Friendly—Unfriendly.
L—Leader—Follower.
F—Fights—Avoids Fights.
W—Grown-up—Childish.
C—Assured in Class—Shy in Class.
D—Daring—Afraid.
U—Unkempt—Tidy.
O—Older Friends—Younger Friends.
S—Humor about Self—Humorless.
N—Attention-getting—Nonattention-getting.
A—Assured with adults—Shy with adults.
P—Popular (likable)—Unpopular (avoided).
H—Happy—Unhappy.
G—Good-looking—Not good-looking.
E—Enthusiastic—Listless.
B—Bossy—Submissive.

In the discussion to follow, these 20 item pairs will be referred to by the first descriptive word or phrase in the pair listed above, but the reader should keep in mind that such a designation refers to a trait or characteristic described by the two opposed word pictures. For example, if we consider the correlation coefficient of .57 obtained between scores upon the variables Fights and Enthusiastic for twelve-year-old boys, we must remember that not only does fighting tend to be associated with enthusiasm, but also avoiding fights tends to be associated with listlessness or lack of enthusiasm.

Scoring.—A child's score on a particular trait was a function of the number of times he was mentioned by his classmates, *both boys and girls*, on the pair of opposed items. In order to use algebraic functions in scoring, one item in each pair, the one associated with activity or expressiveness, was assigned a plus value; the other, associated with inactivity or inexpressiveness, was assigned a negative value. An individual's score on a given trait is the algebraic sum of the number of such "positive" and "negative" mentions he received on the pair of opposed items. Scores for the group of children on any particular trait could range all the way from +100 per cent, if all the children in the class mentioned one child in connection with the positive item, through 0 for those who received no mention at all or who received an equal number of positive and negative mentions, to −100 per cent if all the children in the class mentioned a child in connection with the negative item. The distribution of scores for each pair of items was a fairly symmetrical one and for practical purposes may be considered normal.

Test Administration.—The test was given as a group test in classes of about 40 children, with two proctors present, at both testings. Teachers did not remain in the room. At the twelve-year-old level we directed the children to mention anyone in the classroom in which the test was being given. In this situation each child had as a potential number of judges those 40 children who were with him all day long in the schoolroom and on the playground. At the fifteen-year-old level we directed the children to mention anyone in their half grade, a potential number of judges of between 150 and 200 per child. This shift in procedure seemed a necessary adaptation to the changes which had taken place in the child's school life. His best judges, those who really knew him, were scattered through a number of class groups within his half grade at any given period of the day.

Each child was furnished with an alphabetical list of names of the other children in his classroom (twelve-year-olds) or in his half grade (fifteen-year-olds). These lists were utilized mainly as a help in spelling names; they were seldom referred to as a help in thinking of a name to put down. The children's attitude toward taking this test was in general one of matter-of-fact cooperation.

Some Remarks Concerned with Concurrence, Stability, and Validity of These Opinions. *Concurrence and Stability of Children's Opinions.*—Stability and concurrence of opinion were checked by a variety of techniques. All the evidence points to the conclusion that there is a surprising lack of disagreement among these children in their opinions about each other. At the grade levels studied here, we found that typically about 10 per cent of the group would receive disagreeing votes on any pair of items. Further, most of these individuals about whom there was disagreement had scores close to the average or modal category, receiving only two or three votes (one positive and one negative, or two positive and one negative, etc.). When individuals clearly deviated from the modal category there was rarely any disagreement about them.

Another method used to examine concurrence was correlation between two sets of judgments at each testing. On each trait for each subject two sets of scores were obtained by computing the score for one-half of the judges (selected at random) and then the other half. The average $r_{\frac{1}{2}\frac{1}{2}}$ (raised by the Brown-Spearman formula) for the 20 variables was .71 and .70 for boys and for girls respectively at the twelve-year-level and .77 and .78 for boys and for girls at the fifteen-year-level.

One group (91 boys and 96 girls) in the seventh grade was tested and retested after a 10-day interval. Correlations were computed between the two sets of scores for each trait. The average of these 20 correlations was .76 for boys and .80 for girls.

The magnitude of these measures of reliability, both $r_{\frac{1}{2}\frac{1}{2}}$ and $r_{\text{test/retest}}$, seemed to be closely related to the total frequency of mention on a pair of items and not to frequency of disagreeing votes. There were many more votes on such a characteristic as Active in Games than on one like Humor about Self. The former is a much more tangible quality and also much more frequently thought of by the children in the practical organization of their social living on the playground.

Validity of These Opinions.—We have not been concerned here with the question of whether a particular score on one of these item pairs is a true measure of that aspect of a particular child's personality. Rather we have thought of scores obtained by the Guess Who technique as measures of the environment of opinion in which each child lives—an important aspect of the adolescent's environment. Probably no child judge, when he is mentioning his classmates on this test, is giving his own objective, independently-arrived-at opinion. As he functions in the group, he acquires the attitudes of the group toward his fellows. And as the recipient or subject of these opinions and attitudes, each child probably functions in some dynamic interacting pattern with the prevailing opinions about him. In comparing adult observers' and children's opinions, again we were not so much concerned with checking the validity of one set of data by the other as we were with trying to determine what similar and dissimilar values or mores were operating in the formulation of the opinions.

The Procedures Used in Analyzing the Children's Opinions for Status Values

Sources of Evidence Used in Arriving at Children's Evaluations.—Since our major purpose is to discover the relative values which the 20 traits or characteristics have for boys and for girls at the two age levels, the reader should clearly understand that in this study there is no single, unequivocal criterion of what the children regard as important or prestige-leading. There are several types of evidence which the writer believes point to certain conclusions regarding these evaluations, but the data are, in a sense, forms of circumstantial evidence, and the interpretations may therefore be open to question. It is mainly through the relationships which the opinion scores have to each other (correlation technique) that the significance of these traits for each age-sex group is sought.

The correlation data have been organized to answer the following questions: (*a*) Which traits do the children think of as belonging together, *i.e.*, what traits form groups or clusters in the sense that they are usually either all assigned to a particular child or are all omitted from his characterization by his peers who judge him? For example, if we had included physical traits such as large-small and strong-weak, we should probably have found that those children who were mentioned by their classmates as *large* usually would have been mentioned as *strong;* similarly other children would probably have been voted as both *small* and *weak.* Such traits would have formed what we are calling a "cluster" or "constellation." (*b*) What is the pattern of the relationship (correlation profile) between each of the clusters and the remaining traits or other clusters for each group of children? If a twelve-year-old boy were voted large and strong by most of his class, on *which* other pairs of word pictures would there be some tendency for the group also to mention him and would these mentions be on the positive or negative item in the pair? (*c*) What generality does a particular trait or cluster of traits have? If a boy were considered large and strong by the group, would he frequently be mentioned in connection with a great many other traits such as friendly, leader, likable, good-looking, happy, humorous, or only infrequently in connection with a few of these? In other words, we wish to know for each trait to what extent the factors, which were determining individual differences in it, were permeating other traits for that group.

As an integral part of the above analyses of the quantitative data, case-history material for about 30 children who received extreme scores on one or more clusters at one grade level or the other has been used as evidence. This material includes mainly cumulative scores on the Guess Who test and anecdotal and rating records made by adults.

Interpretations have rarely, if ever, been made on any one single technique or kind of data. The evidences from the various procedures have been examined in a sense simultaneously, not as single threads but as a fabric. In the next section, where the findings are discussed, use will be made of such terms as "evaluations," "prestige value," "prototype of the ideal boy or girl." Statements related to such terms are interpretations made by the writer after study of all the relevant data.

Correlations between Scores on the 20 Traits Are Basic Data.—The first step in the analysis was the computation of the intercorrelations (r) between the 20 variables for each of the four age-sex groups. They are presented in Tables 2, 3, 4, and 5 for boys at the twelve-year and fifteen-year levels, and for girls at the twelve- and fifteen-year levels respectively. These r's were obtained in the usual way: scores received by the children on each trait were correlated with scores on every other trait, using as N the number of children in each age-sex group.

Techniques Used in Organizing the Intercorrelations.—In order to answer the three questions listed above concerning clustering, patterning, and generality of these traits, two quantitative techniques were used to organize the intercorrelations, *viz.*, correlation-

TABLE 2.—INTERCORRELATIONS BETWEEN 20 TRAITS FOR TWELVE-YEAR-OLD BOYS ($N = 170$)

Trait	*R*	*T*	*N*	*B*	*U*	*F*	*D*	*L*	*V*	*S*	*Y*	*P*	*G*	*E*	*H*	*J*	*A*	*C*	*W*	*O*
R—Restless	.....	.88	.71	.40	.55	.65	.15	.34	.32	.06	.25	−.21	−.14	.47	.45	.54	.38	−.05	−.31	.15
T—Talkative	.88	.....	.73	.45	.40	.61	.29	.41	.35	.17	.31	−.05	−.09	.50	.58	.64	.53	.10	−.32	.15
N—Attention-getting	.71	.73	.....	.43	.33	.47	.20	.30	.20	.00	.19	−.19	.11	.32	.37	.47	.44	.18	−.33	.03
B—Bossy	.40	.45	.43	.....	.42	.63	.31	.35	.40	−.07	.23	−.21	−.13	.27	.22	.34	.14	.03	.09	.18
U—Unkempt	.55	.40	.33	.42	.....	.60	.16	.17	.21	−.01	.04	−.27	−.31	.20	.14	.28	.11	−.27	.06	.27
F—Fights	.65	.61	.47	.63	.60	.....	.64	.59	.65	.24	.41	.11	.04	.57	.49	.62	.32	.02	.13	.43
D—Daring	.15	.29	.20	.31	.16	.64	.....	.76	.76	.57	.59	.55	.36	.64	.56	.62	.37	.16	.26	.49
L—Leader	.34	.41	.30	.35	.17	.59	.76	.....	.74	.51	.61	.47	.31	.65	.59	.66	.46	.25	.04	.41
V—Active in games	.32	.35	.20	.40	.21	.65	.76	.74	.....	.41	.61	.45	.33	.61	.45	.55	.27	.03	.24	.50
S—Humor about self	.06	.17	.00	−.07	−.01	.24	.57	.51	.41	.....	.56	.60	.30	.58	.55	.52	.42	.16	.11	.25
Y—Friendly	.25	.31	.19	.23	.04	.41	.59	.61	.61	.56	.....	.49	.39	.59	.51	.52	.38	.24	.08	.34
P—Popular	−.21	−.05	−.19	−.21	−.27	.11	.55	.47	.45	.60	.49	.....	.60	.51	.48	.35	.23	.11	.16	.34
G—Good-looking	−.14	−.09	.11	−.13	−.31	.04	.36	.31	.33	.30	.39	60	.....	.33	.25	.19	.11	.18	.09	.20
E—Enthusiastic	.47	.50	.32	.27	.20	.57	.64	.65	.61	.58	.59	.51	.33	.....	.69	.72	.54	.06	−.06	.29
H—Happy	.45	.58	.37	.22	.14	.49	.56	.59	.45	.55	.51	.48	.25	.69	.....	.75	.60	.25	−.16	.30
J—Humor about jokes	.54	.64	.47	.34	.28	.62	.62	.66	.55	.52	.52	.35	.19	.72	.75	.....	.57	.23	−.08	.29
A—Assured with adults	.38	.53	.44	.14	.11	.32	.37	.46	.27	.42	.38	.23	.11	.54	.60	.57	.....	.34	−.30	.19
C—Assured in class	−.05	.10	.18	.03	−.27	.02	.16	.25	.03	.16	.24	.11	.18	.06	.25	.23	.34	.....	−.15	−.13
W—Grown-up	−.31	−.32	−.33	.09	.06	.13	.26	.04	.24	.11	.08	.16	.09	−.06	−.16	−.08	−.30	−.15	.....	.23
O—Older Friends	.15	.15	.03	.18	.27	.43	.49	.41	.50	.25	.34	.34	.20	.29	.30	.29	.19	−.13	.23	

Table 3.—Intercorrelations between 20 Traits for Fifteen-year old Boys ($N = 169$)

Traits	*R*	*T*	*N*	*B*	*U*	*F*	*D*	*L*	*V*	*S*	*Y*	*P*	*G*	*E*	*H*	*J*	*A*	*C*	*W*	*O*
R—Restless	.....	.90	.64	.29	.08	.37	.23	.17	.10	.05	.11	−.05	−.03	.18	.38	.48	.27	.00	−.64	.04
T—Talkative	.90	.....	.72	.29	.01	.35	.24	.15	.09	.12	.19	−.05	.01	.22	.43	.56	.44	.19	−.48	.12
N—Attention-getting	.64	.72	.....	.53	−.12	.31	.19	.18	.18	−.12	.15	−.11	.12	.20	.25	.31	.39	.21	−.29	.29
B—Bossy	.29	.29	.53	.....	−.12	.63	.51	.28	.41	−.21	.10	.11	.45	.18	.15	.23	.05	−.02	−.01	.18
U—Unkempt	.08	.01	−.12	−.12	.....	−.10	−.22	−.32	−.23	−.25	−.50	−.55	−.65	−.55	−.38	−.21	−.29	−.17	−.23	−.23
F—Fights	.37	.35	.31	.63	−.10	.....	.79	.48	.67	.23	.42	.36	.40	.46	.53	.61	.21	−.12	−.06	.36
D—Daring	.23	.24	.19	.51	−.22	.79	.....	.59	.66	.42	.52	.56	.53	.51	.58	.61	.28	−.02	.02	.30
L—Leader	.17	.15	.18	.28	−.32	.48	.59	.....	.68	.38	.56	.64	.49	.60	.52	.44	.29	.12	.00	.35
V—Active in Games	.10	.09	.18	.41	−.23	.67	.66	.68	.....	.30	.56	.60	.52	.53	.52	.45	.19	.01	.03	.35
S—Humor about Self	.05	.12	−.12	−.21	−.25	.23	.42	.38	.30	.....	.56	.56	.25	.51	.62	.55	.40	.21	.05	.24
Y—Friendly	.11	.19	.15	.10	−.50	.42	.52	.56	.56	.56	.....	.75	.60	.70	.72	.52	.47	.20	.13	.31
P—Popular	−.05	−.05	−.11	11	−.55	.36	.56	.64	.60	.56	.75	.....	.69	.76	.63	.44	.27	.10	.17	.27
G—Good-looking	−.03	.01	.12	.45	−.65	.40	.53	.49	.52	.25	.60	.69	.....	.57	.43	.33	.19	.01	.27	.31
E—Enthusiastic	.18	.22	.20	.18	−.55	.46	.51	.60	.53	.51	.70	.76	.57	.....	.72	.55	.44	.07	.06	.43
H—Happy	.38	.43	.25	.15	−.38	.53	.58	.52	.52	.62	.72	.63	.43	.72	.....	.71	.56	.23	−.16	.30
J—Humor about Jokes	.48	.56	.31	.23	−.21	.61	.61	.44	.45	.55	.52	.44	.33	.55	.71	.....	.51	.20	−.10	.22
A—Assured with Adults	.27	.44	.39	.05	−.29	.21	.28	.29	.19	.40	.47	.27	.19	.44	.56	.51	.....	.50	.08	.19
C—Assured in Class	.00	.19	.21	−.02	−.17	−.12	−.02	.12	.01	.21	.20	.10	.01	.07	.23	.20	.50	.....	.19	.09
W—Grown-up	.64	−.48	−.29	−.01	−.23	−.06	.02	.00	.03	.05	.13	.17	.27	.06	−.16	−.10	.08	.19	.....	.24
O—Older Friends	.04	.12	.29	.18	−.23	.36	.30	.35	.35	.24	.31	.27	.31	.43	.30	.22	.19	.09	.24	

TABLE 4.—INTERCORRELATIONS BETWEEN 20 TRAITS FOR TWELVE-YEAR-OLD GIRLS ($N = 169$)

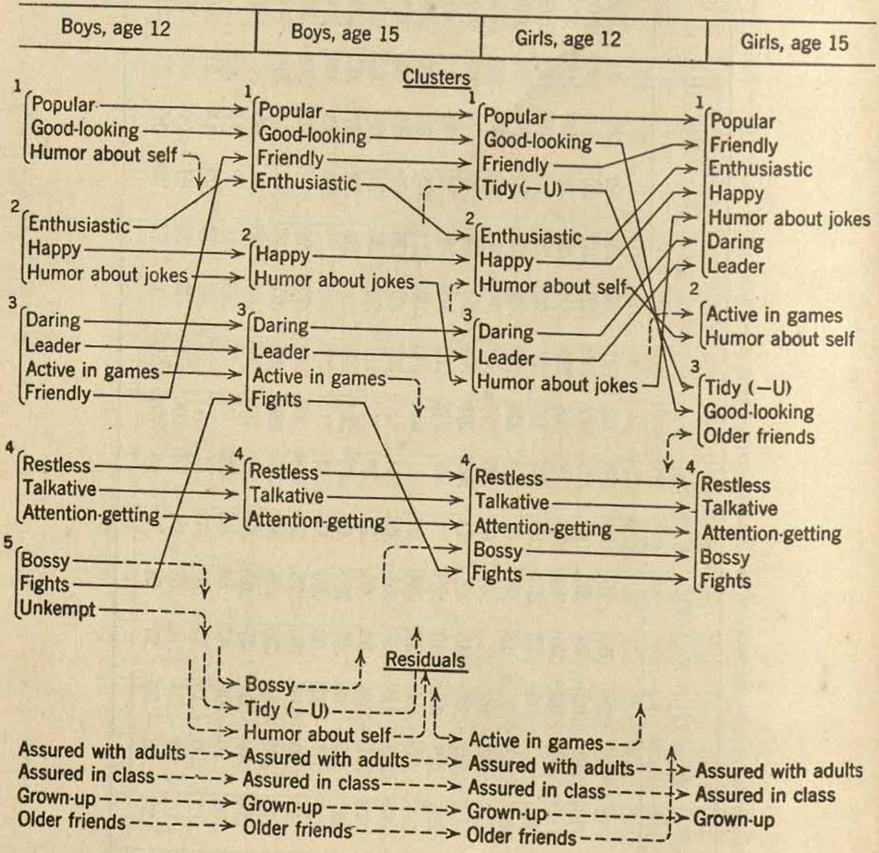
Trait	*R*	*T*	*N*	*B*	*U*	*F*	*D*	*L*	*V*	*S*	*Y*	*P*	*G*	*E*	*H*	*J*	*A*	*C*	*W*	*O*
R—Restless	.....	.74	.48	.40	.56	.47	−.05	.01	.07	−.16	−.17	−.67	−.35	−.25	−.18	.00	.08	−.10	.02	.02
T—Talkative	.74	.....	.56	.52	.34	.54	.21	.31	.28	−.02	.04	−.42	−.14	−.09	.07	.21	.41	.20	.07	.15
N—Attention-getting	.48	.56	.....	.60	.23	.41	−.03	.15	.16	−.25	.02	−.38	−.04	−.16	−.13	.01	.25	.07	.12	.13
B—Bossy	.40	.52	.60	.....	.14	.51	−.03	.23	.22	−.30	.04	−.51	−.06	−.24	.18	−.13	.41	.05	.27	.10
U—Unkempt	.56	.34	.23	.14	.....	.35	−.13	−.08	.09	−.20	−.36	−.52	−.59	−.35	−.34	−.13	−.12	−.25	−.17	−.14
F—Fights	.47	.54	.41	.51	.35	.....	.16	.25	.39	−.17	−.11	−.46	−.10	−.22	−.18	.01	.16	−.03	.03	.03
D—Daring	−.05	.21	−.03	−.03	−.13	.16	.....	.57	.47	.43	.26	.29	.15	.43	.48	.49	.21	.34	.07	.23
L—Leader	.01	.31	.15	.23	−.08	.25	.57	.....	.53	.42	.44	.23	.08	.45	.50	.47	.39	.43	.05	.24
V—Active in Games	.07	.28	.16	.22	.09	.39	.47	.53	.....	.15	.08	.00	.01	.23	.12	.28	.22	.21	.09	.20
S—Humor about Self	−.16	−.02	−.25	−.30	−.20	−.17	.43	.42	.15	.....	.36	.51	.12	.58	.61	.49	−.13	.23	−.14	.14
Y—Friendly	−.17	.04	.02	.04	−.36	−.11	.26	.44	.08	.36	.....	.44	.33	.54	.49	.24	.31	.30	−.01	.12
P—Popular	−.67	−.42	−.38	−.51	−.52	−.46	.29	.23	.00	.51	.44	.....	.42	.63	.59	.26	.03	.25	−.09	.08
G—Good-looking	−.35	−.14	−.04	−.06	−.59	−.10	.15	.08	.01	.12	.33	.42	.....	.35	.29	.18	.04	.15	.03	.23
E—Enthusiastic	−.25	−.09	−.16	−.24	−.35	−.22	.43	.45	.23	.58	.54	.63	.35	.....	.69	.55	.15	.24	−.01	.28
H—Happy	−.18	.07	−.13	.18	−.34	−.18	.48	.50	.12	.61	.49	.59	.29	.69	.....	.58	.28	.34	−.02	.20
J—Humor about Jokes	.00	.21	.01	−.13	−.13	.01	.49	.47	.28	.49	.24	.26	.18	.55	.58	.....	.22	.25	.03	.27
A—Assured with Adults	.08	.41	.25	.41	−.12	.16	.21	.39	.22	−.13	.31	.03	.04	.15	.28	.22	.....	.38	.20	.34
C—Assured in Class	−.10	.20	.07	.05	−.25	−.03	.34	.43	.21	.23	.30	.25	.15	.24	.34	.25	.38	.....	.17	.17
W—Grown-up	.02	.07	.12	.27	−.17	.03	.07	.05	.09	−.14	−.01	−.09	.03	−.01	−.02	.03	.20	.17	.....	.27
O—Older Friends	.02	.15	.13	.10	−.14	.03	.23	.24	.20	.14	.12	.08	.23	.28	.20	.27	.34	.17	.27	

TABLE 5.—INTERCORRELATIONS BETWEEN 20 TRAITS FOR FIFTEEN-YEAR-OLD GIRLS ($N = 181$)

Trait	*R*	*T*	*N*	*B*	*U*	*F*	*D*	*L*	*V*	*S*	*Y*	*P*	*G*	*E*	*H*	*J*	*A*	*C*	*W*	*O*
R—Restless	.....	.74	.63	.33	.16	.50	.15	.26	.20	−.02	.21	−.02	.03	.16	.24	.24	.29	−.09	−.13	.17
T—Talkative	.74	.....	.69	.46	−.02	.59	.33	.44	.28	.12	.49	.23	.17	.33	.44	.38	.50	.11	−.06	.22
N—Attention-getting	.63	.69	.....	.56	−.02	.46	.12	.26	.18	−.18	.29	.04	.24	.19	.16	.16	.37	.07	−.07	.26
B—Bossy	.33	.46	.56	.....	−.03	.52	.23	.29	.25	−.09	.21	.05	.07	.10	.10	.18	.36	.20	.06	.13
U—Unkempt	.16	−.02	−.02	−.03	.....	.03	−.06	.01	.10	.06	−.29	−.42	−.67	−.19	−.14	−.04	−.09	−.18	−.25	−.39
F—Fights	.50	.59	.46	.52	.03	.....	.45	.40	.36	.15	.34	.19	.03	.30	.30	.39	.45	.13	16	.27
D—Daring	.15	.33	.12	.23	−.06	.45	.....	.78	.60	.68	.65	.65	.06	.73	.58	.65	.54	.31	.07	.21
L—Leader	.26	.44	.26	.29	.01	.40	.78	.....	.58	.62	.74	.68	.06	.76	.60	.68	.60	.32	.01	.18
V—Active in Games	.20	.28	.18	.25	.10	.36	.60	.58	.....	.41	.33	.33	−.11	.38	.33	.40	.32	.11	−.14	−.08
S—Humor about Self	−.02	.12	−.18	−.09	.06	.15	.68	.62	.41	.....	.57	.61	−.11	.69	.63	.68	.32	.17	.00	.01
Y—Friendly	.21	.49	.29	.21	−.29	.34	.65	.74	.33	.57	.....	.78	.35	.78	.68	.63	.59	.37	.08	.27
P—Popular	−.02	.23	.04	.05	−.42	.19	.65	.68	.33	.61	.78	.....	.35	.77	.67	.63	.43	.33	.03	.16
G—Good-looking	.03	.17	.24	.07	−.67	.03	.06	.06	−.11	−.11	.35	.35	.....	.20	.13	.06	.14	.14	.23	.52
E—Enthusiastic	.16	.33	.19	.10	−.19	.30	.73	.76	.38	.69	.78	.77	.20	.....	.71	.74	.53	.23	.01	.23
H—Happy	.24	.44	.16	.10	−.14	.30	.58	.60	.33	.63	.68	.67	.13	.71	.....	.68	.44	.15	−.06	.10
J—Humor about Jokes	.24	.38	.16	.18	−.04	.39	.65	.68	.40	.68	.63	.63	.06	.74	.68	.....	.48	.21	.01	.11
A—Assured with Adults	.29	.50	.37	.36	−.09	.45	.54	.60	.32	.32	.59	.43	.14	.53	.44	.48	.....	.45	.10	.21
C—Assured in Class	−.09	.11	.07	.20	−.18	.13	.31	.32	.11	.17	.37	.33	.14	.23	.15	.21	.45	.....	.09	.00
W—Grown-up	−.13	−.06	−.07	.06	−.25	.16	.07	.01	−.14	.00	.08	.03	.23	.01	−.06	.01	.10	.09	.....	.44
O—Older Friends	.17	.22	.26	.13	−.39	.27	.21	.18	−.08	.01	.27	.16	.52	.23	.10	.11	.21	.00	.44	

profile analysis and factor analysis.* Samples of graphic presentation of the correlation-profile analyses are presented in Figs. 1 to 4, where one *cluster* is shown for each age-sex group. In each one of these figures it may be noted that Enthusiastic is a member of the cluster but the *pattern* of its relationship with the other variables is different for each group. Space does not permit reproducing from the original monograph the charts in which were presented all the clusters for each group (see Table 6 for a listing of traits in each of these clusters). However, the cluster graphs can be drawn as those in Figs. 1 to 4 were, by plotting the correlations in Tables 2 to 5. For example, in Fig. 1 the correlation profile of the variable Enthusiastic was obtained in the following manner:

TABLE 6.—EVALUATION OF ADOLESCENT PERSONALITY BY ADOLESCENTS



On a graph which had the *r* scale as

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* For further discussion of the application of these techniques see Chap. II, "Techniques and Data Used in the Analysis," C. McC. Tryon (1); for a complete presentation see R. C. Tryon (2).

Subsequent discussion in this chapter of trait organization will be based to a large extent on the clusters determined by the correlation-profile analysis. However, these findings were corroborated and elucidated by data from the factor analysis. The findings on reliability discussed above under concurrence and stability of opinions were also used as a source of evidence.

the ordinate and the names of the 20 traits as the successive abscissas, the *r* between Enthusiastic (*E*) and each of the other 19 abscissal traits (see Table 2, line 14) was plotted and a line graph of these *r*'s was drawn, giving the profile of its relations with other traits. In this same figure the profiles of Happy (*H*) and Humor about Jokes (*J*) were also plotted; the symbols *E*, *H*, and *J* were used to indicate the *r* points on the ordinates. Similarly we brought together for each group in other graphs those traits whose correlation profiles were congruent. The heavy-line profile in each graph is the mean profile of the traits in the cluster depicted. For each age-sex group there were a few traits which we have called "residuals" because none of them fitted any of the determined cluster profiles (see Table 6).

The order of the variables on the abscissa (and in the correlation tables) roughly presents in proximity those traits that tend to cluster in each of the four groups. The same order has been maintained for all groups to facilitate comparisons between groups.

Analysis of Trait Organization

In the following pages the findings for each group will be presented and interpretations will be offered. The groups will be considered in the following order: twelve-year-old boys, fifteen-year-old boys, twelve-year-old girls, and fifteen-year-old girls. Comparisons between groups will be made as successive groups are examined. For each group the several clusters (see Table 6) will be discussed from the point of view of the statistical data and the case-history material.

Organization of Traits for Twelve-year-old Boys.—There were five clusters of traits determined for this group and there were four residual traits whose profiles were not satisfactorily congruent with any one of the clusters (see Table 6).

Cluster 1. *Popular: Good-looking: Humor about Self.*—This cluster has the least connotation of aggressiveness and restless energy output among the five clusters, since it is the only one which correlates very low with the six variables in Clusters 4 and 5 (*e.g.*, Restless, Attention-getting, Bossy, Fights); the majority of these *r*'s are mildly negative but of the order −.10. It shows its highest relationship with Cluster 3, physical competence, and Cluster 2, emotional buoyancy. Even with the traits in these two clusters, correlations are not markedly high. In fact, all the evidence on common components or generality indicates that this Popular:* Good-looking: Humor about Self cluster is one of lesser significance.

Boys who had outstandingly positive scores were variously described by adult observers as unassuming, pleasant, quiet, gentle, well-behaved, and unassertive. Some of these boys were leaders on the playground. Others were not, but in every case there was at least average competence in game skills.

In describing the boys who received the extreme negative scores on this cluster, adults observers used such terms as stand-offish, apathetic, and inhibited about several; as supercilious, bickering, highhanded, dominating, noisy, irrepressible about others. The former were isolated from play groups; some of the latter were rather successful leaders.

The evidence suggests that if a boy had very high scores only on this one cluster he would not represent a prototype of the twelve-year-old boy's ideal; he would be a person of whom his peers were genuinely fond, however. Certain "feminine" qualities would characterize him, but he would not be considered in any sense a sissy. Negative scores would represent a handicap in establishing warm personal relationships but would not prevent achievement of leadership status in the group.

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* Our use of the term "Popular-Unpopular" to describe this pair of word pictures is a misnomer; "Liked-Ignored" would more nearly have summarized the children's interpretation of these items.

Cluster 2. Enthusiastic: Happy: Humor about Jokes.—The traits in this cluster (see Fig. 1) show positive *r*'s with every other trait with one exception, *viz.*, negative *r*'s of negligible magnitude with Grown-up. The highest relationship shown by this cluster is with leadership and physical competence, Cluster 3, but it also has a good deal in common with restless hyperactivity, Cluster 4, and with likableness, Cluster 1. It has a relatively high degree of generality; in other words, factors operating to create individual differences in this cluster are operating to a marked degree in other clusters.

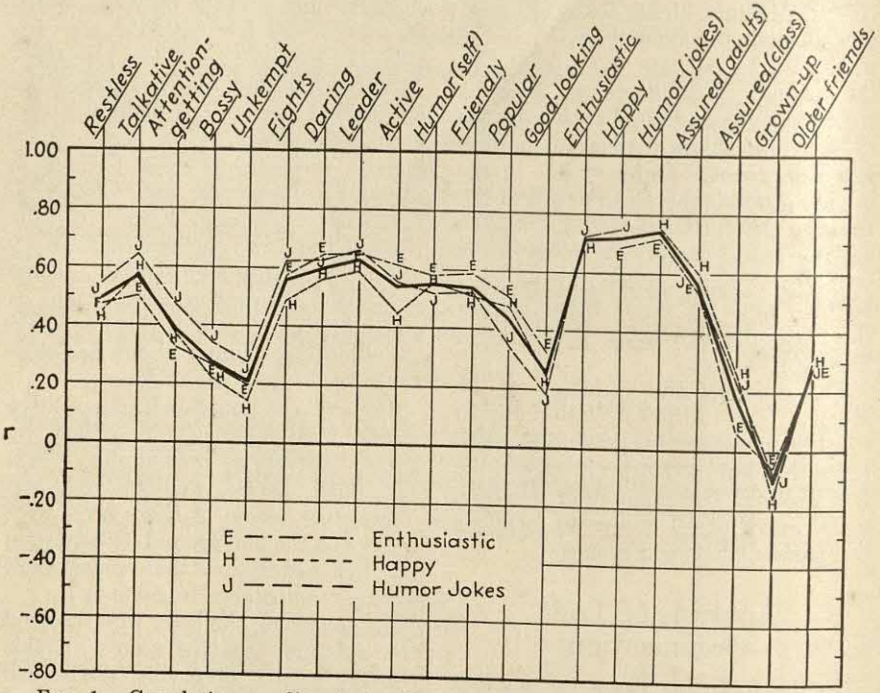

FIG. 1.—Correlation profiles for twelve-year-old boys. Enthusiastic: Happy: Humor-Jokes cluster. (*From Monogr. Soc. Res. Child Devel.*, 1939, **4**, *No.* 4, *Fig.* 1*b*, *p* 26. *Reproduced with permission.*)

Included frequently in adult comments about boys who received high positive scores are the following descriptions: very high energy output, extreme enthusiasm, talks incessantly. For several of these cases there were comments which indicated marked nervous irritability and tension.

For boys who received extreme negative scores the adult comments vary a great deal. Some of these boys were described as showing symptoms of emotional conflict and anxiety; others as having a very low energy output; others had specialized interests or responsibilities that removed them from the group.

Both the statistical data and the adult comments suggest that the children have in mind something more than just good humor and buoyancy of mood when judging their fellows on these three pairs of word pictures. They apparently consider such components in behavior as energy output, boisterousness, and the tendency to take the center of the stage and to be amusing there. All the evidence suggests that this cluster is an important determiner of status.

Cluster 3. *Daring: Leader: Active in Games: Friendly.*—The profiles of all four of these traits are entirely in the positive area. Relationships are high with both Clusters 1 and 2, likableness and emotional buoyancy, just discussed above. There is fairly marked relationship with Cluster 5, which describes physical and verbal aggressiveness; and low though positive relationship with restless hyperactivity, Cluster 4. The statistical evidence indicates that this cluster has greater generality than any of the others.

All the boys who received extreme positive scores had certain characteristics in common, according to adult observers' opinions. There was mention of vigorous, active play; of enjoying and directing games, usually in a good-natured fashion; and of confidence and assurance among their peers. However, other comments by adults and likewise their scores on other Guess Who variables indicate that they were very unlike in other aspects of their behavior and personalities.

Those who received extreme negative scores were social isolates or even scapegoats, according to observers' records. Their scores on the remaining Guess Who traits were for the most part rather markedly negative, suggesting that they carried the burden of generalized negative affect or halo from the group.

All the evidence points to the interpretation that this is the most prestige-laden cluster for twelve-year-old boys. At one extreme the boys are admired and respected, at the other ridiculed and shunned.

Cluster 4. *Restless: Talkative: Attention-getting.*—This cluster shows fairly high positive correlations with aggressiveness, Cluster 5, and also with emotional buoyancy, Cluster 2. With leadership and physical competence, Cluster 3, the relationship is low though positive; with likableness, Cluster 1, it is low and negative. The generality of its common components also is relatively low. The relationship of the correlation profile of one residual variable, Grown-up, is clearly negative with this cluster profile, suggesting that restless hyperactivity is considered rather childish.

Adults' comments about boys who received extreme positive scores indicate that they had a high energy output, which in some situations, particularly the classroom, was of a disruptive, disorganized kind. However, some of them were capable of controlled, organized participation on the playground.

Among those who received extreme negative scores the adult observations distinguished two types, those who had easy, comfortable control of their energy and those who were shy, inhibited, and withdrawing.

Though this cluster is one of lesser significance in determining prestige, it has for the teacher or anyone dealing with the twelve-year-old boy some importance, since the traits in this cluster show definite, though not marked, positive correlation with such prestige-lending qualities as Leader, Humor about Jokes, Enthusiastic, Happy, and even Friendly.

Cluster 5. *Bossy: Fights: Unkempt.* The pattern of this cluster resembles the one just discussed, but it shows the following differences: It is less closely related to emotional buoyancy, Cluster 2, and has more in common with leadership and skill in games, Cluster 3. Like the preceding cluster, it shows some negative relationship with likableness, Cluster 1.

The items describing these traits imply components of belligerence and domination. However, the boys who did receive extreme positive scores were never pictured as belligerent in the observers' records but rather as enthusiastic, good-natured, vigorous, noisy, and so on. Several boys whom adults considered belligerent did not receive high positive scores on this cluster from the children, but they did receive negative scores on likableness, Cluster 1.

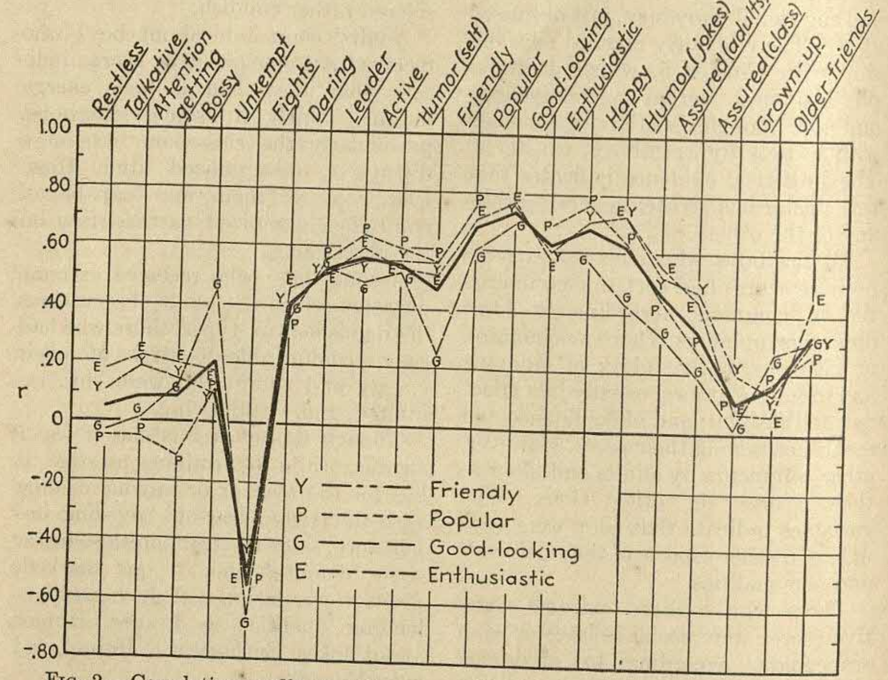

Fig. 2.—Correlation profiles for fifteen-year-old boys. Popular: Good looking: Friendly: Enthusiastic cluster. (*From Monogr. Soc. Res Child Devel.*, 1939, **4**, *No.* 4, *Fig. 3a, p.* 38. *Reproduced with permission.*)

Study of the records of those boys who received negative scores on this cluster suggests a lack in them of readiness to compete in physical activity, a lack of capacity to "take it."

In general, positive scores would be considered desirable by these twelve-year-old boys; nearly every one of them would have preferred to be thought of as an untidy, bossy fighter than a neat, submissive person who avoids fights.

Residual Traits for Twelve-year-old Boys.—None of these traits has much generality. Grown-up is negatively associated with restless hyperactivity, Cluster 4. Assured with Adults and Assured in Class are most related to emotional buoyancy, Cluster 2. Older Friends has a fairly high correlation with leadership and physical competence, Cluster 3.

Summary of Interpretations for Twelve-year-old Boys.—There is a marked tendency for children of this age to emphasize for boys the desirability of activity of any sort; to prefer in the boy aggressiveness, boisterousness, and unkemptness to submissiveness, reserve, and tidiness; to appreciate certain "feminine" components if they are associated in the individual with other "masculine" qualities; to respect above all competence in group games.

Organization of Traits for Fifteen-year-old Boys.—Four clusters were determined for this group, involving 13 of the traits. There were seven residual traits which did not satisfactorily fit any of the cluster profiles.

The four clusters resemble the first four clusters determined for younger boys, but not all to the same degree. Cluster 1 has changed more than the others. Cluster 5, aggressiveness, for younger boys has disappeared entirely (see Table 6).

Cluster 1. *Popular: Good-looking: Friendly: Enthusiastic.*—The first two of these traits appeared in Cluster 1 for the younger boys. At this older age level Friendly and Enthusiastic replace Humor about Self (see Fig. 2). The following are some of the changes in relationships between this cluster and other clusters or single traits: there is much more marked negative correlation with Unkempt (r's of the order $-.55$ instead of $-.25$) and higher positive correlation with Fights. There is much closer relationship with leadership and competence in physical skills, Cluster 3. With emotional buoyancy, Cluster 2, the relationship is still high. Certain residual traits show high positive relationships with this cluster, *viz.*, Tidy (Unkempt reflected), Humor about Self, and Older Friends. Statistical evidence indicates that traits in this cluster have high generality.

Study of individual histories leaves no doubt that the meaning and value which this Cluster 1 has for the fifteen-year-old boys are different than Cluster 1 had for the younger group. The boys who received extreme positive scores were all described by adults at this later age as outstandingly successful with girls in mixed-sex social situations, as physically mature, as concerned about their clothes and grooming. Some of these boys had not been considered Popular, Good-looking, Friendly, or Enthusiastic at the earlier testing. Others whose scores were very high on these traits earlier had lost status; adult observations indicate that immaturity was an important factor in their diminished prestige.

For those who received extreme negative scores on this cluster the adult observations give a picture of the unsuccessful boy among girls.

The evidence was interpreted to mean that this cluster which delineates personableness and social ease is a determiner of heterosexual adjustment for boys at this age and that it is a very important indicator of prestige.

Cluster 2. *Happy: Humor about Jokes.*—The correlation profile of this cluster has changed very little, except for the relationship with Unkempt which is of the order $-.30$ instead of $+.20$. The relationship is still high between this cluster and athletic skill and leadership, Cluster 3; it is also high with personableness and social poise, Cluster 1. There is some positive relation still with restlessness and hyperactivity, Cluster 4. Two residual traits, Assured with Adults and Assured in Class are rather closely related.

Boys who received extreme positive scores are described in adult records, as they were at the earlier age level, as noisy, boisterous, and very active. Frequently they behaved in a fashion that could be called "childish" at this age level. Less extreme positive scores were usually earned by boys who were credited with social maturity and social success. Boys who received extreme negative scores were variously described by adults as quiet, or tense, or isolated, as they were earlier.

This cluster still seems to depict for boys degree of energy output as well as emotional buoyancy. It is still of some importance among factors determining status. However, extreme scores were usually achieved by boys who persisted in twelve-year-old behavior patterns.

Cluster 3. *Daring: Leader: Active in Games: Fights.*—The first three of these traits were also in Cluster 3 for younger boys. The fourth trait, Fights, has replaced Friendly. The profile of this cluster is very similar to the comparable one at the younger age level, except for negative r's with Unkempt and some minor differences, such as higher correlation with Good-looking and Bossy. It is very closely related to Cluster 1, personableness and social poise; and there is still a high correlation with emotional buoyancy, Cluster 2.

Adults describe the boys who received extreme positive and negative scores on this cluster very much as they described them at the earlier level, as competent athletes at one extreme and as isolates and scapegoats at the other. Boys tended to maintain their relative positions on these variables over the 3-year period.

All the evidence suggests that this cluster is still very important in determining status for the boy. However, at this level it does not have quite the unique significance that it formerly had, since it shares importance with personableness and social poise, Cluster 1, with which it is closely associated.

Cluster 4. *Restless: Talkative: Attention-getting.*—Though these same three traits formed a cluster for the twelve-year-old boys, there is evidence that there is some real change in their meaning and significance. Many of the correlations with other traits are closer to zero. For example, most of the *r*'s with Fights, Leader, Active in Games and Enthusiastic range between .15 and .30 for the older group. They were between .30 and .60 for the younger group. There is still some relationship between this cluster and emotional buoyancy, Cluster 2. The residual trait, Grown-up, shows an even higher negative relationship with this cluster than it did earlier. Aside from these relationships, the cluster has very little generality.

Adult descriptions of cases with extreme scores are very similar to descriptions of extreme cases at the earlier level. However, adults more clearly characterized those with extreme positive scores as immature small boys striving for the attention of their peers.

The evidence suggests that restless hyperactivity has become rather irrelevant in the determination of prestige.

Residual Traits for Fifteen-year-old Boys.—Of the seven residual variables (Table 6), Tidy (reflected Unkempt) is apparently the most significant. It shows its greatest relationship with Cluster 1, social ease and personableness; but it also tends to have components in common with masculine skills, Cluster 3, and with buoyancy, Cluster 2. It is the one trait on which values were completely reversed for boys. At the twelve-year-level unkemptness was more acceptable. Humor about Self and Older Friends also show their greatest relationship with the personableness and social ease cluster. Assured with Adults and Assured in Class are most highly related to the emotional-buoyancy cluster as they were for the younger boy. Grown-up is most highly related, but negatively, to restless hyperactivity. Bossy is most closely correlated with masculine skills and daring.

Summary of Interpretations for Fifteen-year-old Boys.—Attributes which are frequently considered "masculine," such as skill in games, fearlessness, and self-assertion, continue to be important determiners of prestige for the fifteen-year-old boy. However, equal emphasis is placed on personableness and social ease and poise in heterosexual situations. Cheerfulness and a sense of humor are important but boisterousness and hyperactivity are regarded as rather childish and unimportant.

Organization of Traits for Twelve-year-old Girls.—Four clusters were determined for twelve-year-old girls. There were five residual traits. Table 6 reveals a tendency for the four clusters to resemble in terms of their component traits the clusters determined for boys, but for the most part the patterning is quite different.

Cluster 1. *Popular: Good-looking: Friendly.*—There is a high negative relationship between this cluster and aggressive hyperactivity, Cluster 4; a high positive relationship with emotional buoyancy, Cluster 2; and positive but low relationship with leadership and jocularity, Cluster 3. The statistical evidence indicates that this cluster is heavily saturated with components common to other variables.

Comparison between the profile pattern of this Cluster 1 and Cluster 1 for boys, which includes Popular and Good-looking at both ages, reveals a number of differences which can be summarized as follows: For girls there is very little relationship (r's of the order .00 to .20) with traits referring to organized activity such as playing games; for boys these relationships were much higher (r's of the order .45 to .65). For girls correlations with such traits as Fights and Restless, which could be considered adult-disapproved behavior, are definitely negative; for boys these correlations were either positive or only mildly negative.

Girls who received extreme positive scores were described by adults as neat, pretty, "feminine," docile, quiet, busy, interested. Those who received extreme negative scores were social isolates. They were either withdrawn or very aggressive.

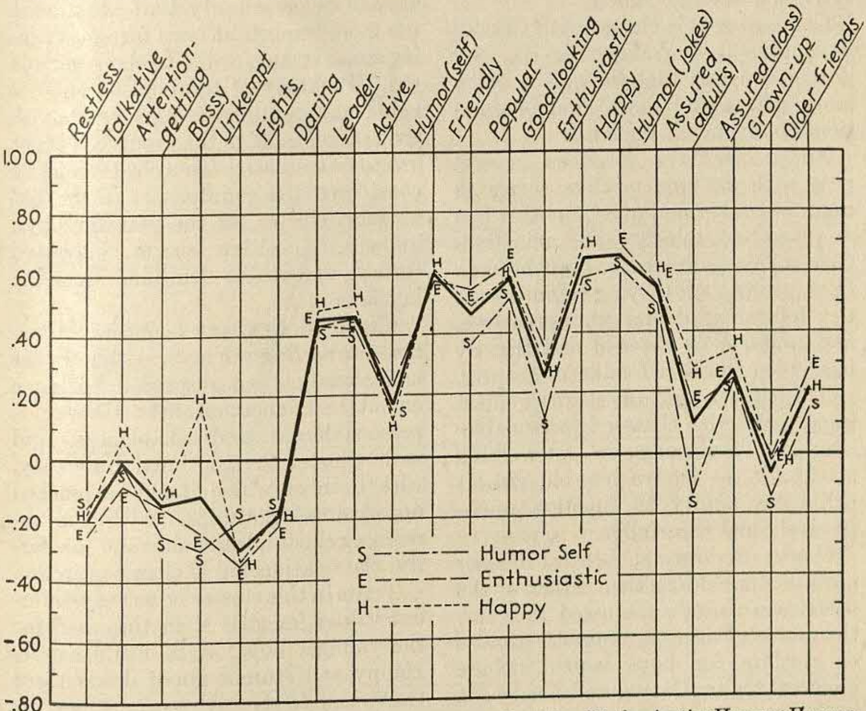

FIG. 3.—Correlation profiles for twelve-year-old girls. Enthusiastic: Happy: Humor-Self cluster. (*From Res. Monogr. Soc. Res. Child Devel.*, 1939, **4**, *No.* 4, *Fig.* 5*b*, *p.* 51. *Reproduced with permission.*)

All the evidence suggests that this is an important cluster for twelve-year-old girls. It seems to discriminate individual difference in "lady-likeness." Positive scores suggest an attractive girl who is cheerful and quietly humorous, rather sedate in school, and only mildly interested in active games.

Cluster 2. *Enthusiastic: Happy: Humor about Self.*—The profile of this cluster (see Fig. 3) is similar in general pattern to that of the preceding one, which depicts personableness and likableness. There are, however, the following differences: milder negative relationship with aggressive hyperactivity, Cluster 4; higher positive *r*'s with leadership and jocularity, Cluster 3. Both of these differences suggest that it has greater connotation of activity and outgoingness.

Comparing this cluster with Cluster 2, emotional buoyancy, for the boy groups, we find that for girls a much more sedate and quiet kind of emotional buoyancy is depicted.

Adult observers described several girls with extreme positive scores as eager but sober and quiet; another one as cheerful, direct, and animated. Girls with negative scores brought forth from adults such varying comments as the following: depressed, unreactive, and solitary; or cheerful and slightly bossy; or uninhibited, talks incessantly.

This cluster probably shares greatest importance with Cluster 1, personableness and likableness, in determining status for the twelve-year-old girl. It delineates ability to function unobtrusively and cheerfully.

Cluster 3. *Daring: Leader: Humor about Jokes.*—More than either of the other two clusters discussed thus far, the profile of this one resembles profiles of clusters for boys which include identical traits, Daring and Leader. It is almost entirely in the positive area (low negative *r*'s with Bossy and Unkempt). But correlations are significantly lower for girls than boys with such traits as Fights, Active in Games, Friendly, Popular, and Good-looking. The statistical data indicate that it has for girls fewer common determiners than any of the other clusters. With only one other cluster, emotional buoyancy, is there a high relationship.

Adult's descriptions of the girls who received extreme positive scores, all include comments on their boyish appearance, behavior, and mannerisms. Other comments which occurred frequently were similar to the following: played hard in games, uninterested in appearance, active, influences group.

The girls who received extreme negative scores were not of the "ladylike" type. Adults' observations depict them as inactive, withdrawn, avoided, left out.

This cluster does not delineate aspects of personality that are among the more important ones for determining social status for the twelve-year-old girl. Probably "tomboyishness" is being differentiated. The tomboyish girl is acceptable to the group but is not one to be emulated. This cluster may be considered the counterpart of the likableness cluster for the younger boys, in which positive scores suggested certain acceptable feminine qualities in the boy.

Cluster 4. *Restless: Talkative: Attention-getting:Bossy: Fights.*—This cluster has already been discussed to some extent in connection with Cluster 1, personableness and likableness, and with Cluster 2, emotional buoyancy, with both of which it shows marked negative relationships. With the remaining cluster, leadership and jocularity, the relationship is close to zero.

Traits in this cluster have very different values for girls than they had for the younger boys. With Enthusiastic, Happy and Humor about Jokes these traits had fairly high correlations for boys, of the order .40 to .60. For girls these relationships are negative though low.

Common to the girls with extreme positive scores according to adults' observations are excessive, uncontrolled output of energy and rather constant seeking of attention. Those with extreme negative scores were described as quiet and unobtrusive. Some of these were isolates, others the stars of attraction.

We may think of this as a rather important cluster for the twelve-year-old girl, since it indicates which behaviors are important for achieving acceptable status and which interfere with such achievement.

Residual Traits for Twelve-year-old Girls.—Among the residual traits, Active in Games is one of the most interesting because for younger boys it was probably the most important single determiner of prestige and for girls it is of negligible importance. Its closest relationship, like that of Older Friends and Assured in Class, is with leadership and jocularity. Assured in Class is also related to likableness and to emotional buoyancy. Assured with Adults and Grown-up have some components in common with hyperactivity.

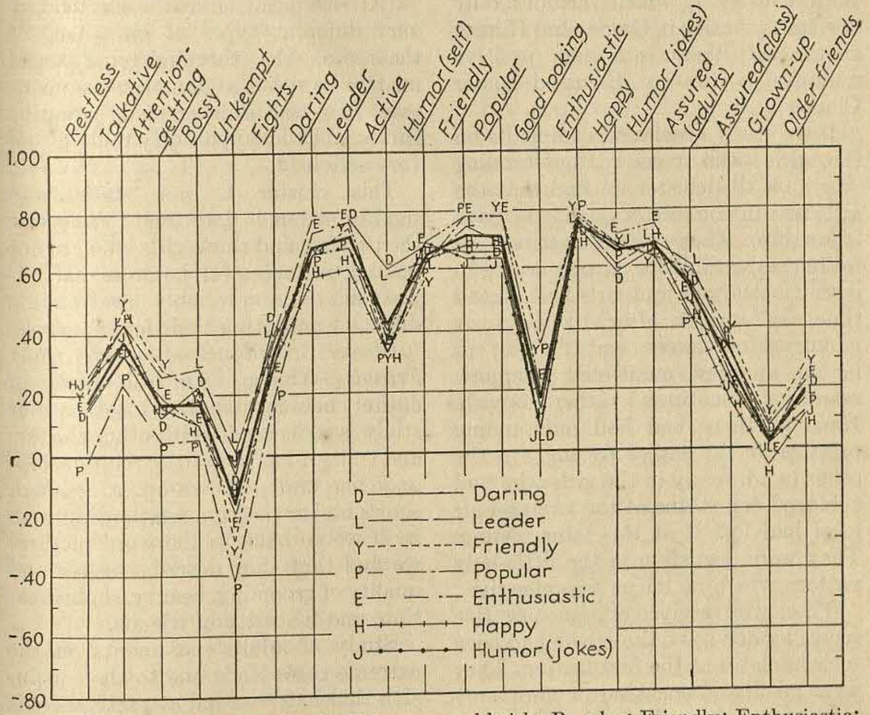

FIG. 4.—Correlation profiles for fifteen-year-old girls. Popular: Friendly: Enthusiastic: Happy: Humor-Jokes: Daring: Leader cluster. (*From Res. Monogr. Soc. Res. Child Devel.*, 1939, 4, *No.* 4, *Fig.* 7a, *p.* 63. *Reproduced with permission.*)

Summary of Interpretations for Twelve-year-old Girls.—The qualities most indicative of prestige for the girl at this age are neat, attractive appearance; friendly but rather demure and docile social manner; quiet good humor; and controlled behavior conforming to adult standards. A certain amount of tomboyishness is acceptable but raucous, noisy activity is not.

Organization of Traits for Fifteen-year-old Girls.—Four clusters of traits were determined for this group. There were only three residuals. During the 3-year interval between testings, a number of changes occurred in the organization of these traits for girls (see Table 6).

Cluster 1. *Popular: Friendly: Enthusiastic: Happy: Humor about Jokes: Daring: Leader.*—This cluster includes two or three traits from each of the first three clusters determined for the younger girls (see Fig. 4). However, its profile pattern is more congruent with almost any one of the clusters for boys than it is with any for younger girls. It is positively though mildly correlated with aggressive hyperactivity, Cluster 4, which includes such traits as Fights, Bossy, Restless. At the previous testing the correlations between these same variables were definitely negative. With a new cluster which delineates sophistication and glamour, Cluster 3, there is practically zero relationship. With Cluster 2, which includes only two traits, Active in Games and Humor about Self, there is a high positive relationship (to be discussed under Cluster 2).

If we study observers' comments on the girls who received outstanding scores on this cluster we find that the girls had in common a quality of good fellowship. They were described as feeling responsible for parties, seeing to it that both boys and girls had a good time; as sought after by boys as partners for games and dances; as having an easy, unaffected, energetic manner, sometimes rather boyish. None of them had had outstanding prestige at the earlier testing. On the other hand, many of the girls who had achieved top status at the twelve-year level had lost it at this later testing. They were persisting in the little-lady pattern which no longer was effective.

Those who received extreme negative scores tended to be those who had been social isolates at the first testing. They were misfits of one kind or another—unpresentable or shy and withdrawn, or "queer."

This is without doubt an important prestige-determining cluster for girls at this age level. It delineates capacity to get along in and to lead large mixed-sex social groups, to make casual social contacts, to put others at their ease.

Cluster 2. Active in Games: Humor about Self.—This is not a "good" cluster statistically, but it suggests an important aspect of social structuring at this age level. It has a high positive correlation with Cluster 1, just discussed. But unlike that cluster, it shows some negative relationship with sophistication and glamour, Cluster 3, and it has lower relationships with traits like Friendly and Popular.

Girls who received high positive scores were described by adults as rather masculine in appearance and manner. Some of them competed in girls' sports; others sought attention by "clowning."

Extreme negative scores selected two very different types of girls. One of these was the thoroughgoing social misfit, the other a glamorous sophisticate who was uninterested in active games and who apparently took herself very seriously.

This cluster is not statistically significant but it does tend to select at the positive end those girls who are not making a successful heterosexual adjustment and probably are having difficulty accepting their feminine role.

Cluster 3. Tidy: Good-looking: Older Friends.—This group of traits forms an entirely new constellation insofar as our study is concerned. With other clusters and traits it has very little relationship; only one trait, Grown-up, a residual, shows higher positive relationship with it. If we go back to the word pictures we find that they describe degree and quality of grooming, beauty, sophistication, and maturity of friends.

Study of adults' comments on the extreme cases leads one to the conclusion that heterosexual attractiveness is being depicted by this cluster. The girls with high positive scores were sophisticated and sought after in boy-girl situations. As individuals they were very different. Some were pleasant and gracious, popular with girls as well as boys. Others were subtly unpleasant or self-centered and demanding.

Among those who received extreme negative scores some were very childish and immature, others were rejected, isolated individuals.

Study of the case-history material points to the conclusion that this is an important constellation for the fifteen-year-old group; that, while heterosexual attractiveness is a highly specific quality, it is considered a very important kind of prestige.

Cluster 4. *Restless: Talkative: Attention-getting: Bossy: Fights.*—These same traits formed a cluster for the younger girls, but the relationship pattern has changed a great deal. The entire profile for older girls is in the positive area. For the younger group there were marked negative *r*'s with such traits as Popular, Good-looking, and Enthusiastic. However, though correlations are all positive for the fifteen-year-olds, they are low. This cluster, like Cluster 3 just discussed, is practically unrelated to any other.

Girls who received extreme positive scores were variously described by adults as noisy, active, striving for the center of the stage, humorous, and so on. Most of them had acceptable and some even outstandingly successful status with the group. Extreme negative scores were associated in adult comments with sedate, demure, withdrawn, or shy behavior.

Apparently for these older girls, as for older boys, this hyperactivity cluster describes individual differences in behavior that are not socially significant.

Residual Traits for the Fifteen-year-old Girls.—There are three residuals. Grown-up is positively related to the sophistication and glamour cluster and to no other. Assured with Adults and Assured in Class show some mild positive relationship with all four clusters, but most definitely with the good-fellowship cluster.

Summary of Interpretations for the Fifteen-year-old Girls.—Prestige for these older girls is achieved through two major channels, either through buoyant, rather aggressive good-fellowship with both boys and girls, or through sophisticated, glamorous qualities which attract the boys.

Our purpose has been to investigate some of the factors involved in the task of maintaining status with one's peers for a group of junior-high-school boys and girls. As the data consisting of children's opinions of each other and cumulative records compiled by adult observers were examined, changes with age were noted and comparisons were made between boys and girls. During the period between ages twelve and fifteen, values for girls underwent some revolutionary changes; values for boys underwent relatively minor changes, mainly in terms of slightly shifted emphases. The most outstanding differences between the younger boys and girls seem to center around those components or qualities which differentiate individuals in terms of amount of aggressiveness and overt, gross activity. One difference should be noted between the fifteen-year-old boys and girls. Attractiveness to the opposite sex for the boys is not thought of as something specific and independent, as it apparently is for girls. Boys, to be successful with girls, must be admired by boys, but girls successful with boys may be either liked, disliked, or possibly regarded with indifference by their own sex.

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CHAPTER XXXII

PERSONALITY PATTERNS IN SCHOOL CHILDREN

R. NEVITT SANFORD

Introduction

The whole child cannot, of course, be studied. The conception of the whole child may, however, guide the efforts of the researcher in child development. If one thinks of the whole child as everything—all the structures and processes—encompassed by the surface of the skin, he will see the impossibility of studying the totality but he will be moved to take account of numerous variables. If one thinks of the whole child as a functioning unity which mobilizes and coordinates its resources in concerted strivings, he will be staggered by the complexity of his subject but he will be concerned to study each variable in relation to numerous others.

The workers who conducted the Harvard Growth Study of School Children* took seriously the conception of the whole child. It was our intention that this study should be comprehensive. Numerous physiological, intellectual, personality, and environment variables were defined and measured from time to time over a 3-year period. The main object of the study was to inquire how the factors of these different types become organized within the individual and how this organization changes as the child grows.

This program for the repeated measurement of numerous variables soon yielded a great mass of data, and we were early confronted with the problem of how to organize this material in a meaningful way. Having adopted the conception of the child as an integrated whole, we could not be content with relationships between isolated pairs of variables, however numerous and valid these might be. It seemed that the individual case study might offer a more adequate approach to our problem. Here at least one could study a variable in its context and, perhaps, come close to doing justice to the enormous complexity of the child. We did in fact make an intensive study of each of our subjects, obtaining in each case not only numerous quantitative measures but a great deal of clinical material. But the publication of case studies on normal school children is beset by numerous practical difficulties, and, what is more important, it is doubtful that case studies can have much practical or scientific value until means for generalizing from them have been found.

The question then—and this is by no means the first time that it has been raised (6)—was how to find some middle ground between the two-variable study on the one hand and the individual case study on the other. To describe the procedure adopted in an attempt to answer this question and to illustrate the results obtained is the purpose of the present paper. In order to accomplish this purpose in the space that is allowed it will be necessary to describe in the briefest possible way the subjects of the study, the variables and the technique for their measurement, and the results bearing on the organization of variables within the person.

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* Margaret Murray Adkins, Elizabeth Almy Cobb, R. Bretney Miller, and the writer. The completed study will be published in a monograph of The Society for Research in Child Development.

Procedures

The Subjects of the Study.—Forty-eight children in an eastern private school were the subjects of the study. There were 21 boys and 27 girls, whose ages at the beginning of the study ranged from five to fourteen years. Forty-three of these children were studied for approximately 3 years, five being lost, usually through graduation, after one or two years. The subjects fall naturally into two groups. First there was an "older group," comprising, roughly, two boys and two girls in each age group from six to fourteen. Then there was a "younger group," consisting of seven five-year-old boys and nine five-year-old girls: all the children who entered the preprimary grade of the school in the preliminary year of the study. In selecting the older children it was our purpose to obtain children who were representative of the school population and whose parents were cooperative. A tentative list of children who were not "problems" by the school standards and who showed on the surface no very marked psychological or physiological peculiarities was considered in conference with the director of the school, and a final selection was made in accordance with her judgment as to which parents would be most cooperative. In the case of the younger group we took all the children who entered the school in a certain year and were fortunate in securing the cooperation of the parents.

These subjects cannot, of course, be regarded as a fair sample of all school children, and we have made no attempt to generalize from them to the population at large. It was our hope, rather, that findings from the intensive study of this small group of subjects would enable us to suggest hypotheses interesting enough to form the basis for further research.

The Variables and Their Measurement.—For convenience, four areas of study were roughly marked off—the physical and physiological, the intellectual and educational, the personality, and the environment. The principal variables within each of these fields may be briefly indicated.*

Physical and Physiological Variables. The variables in this field were with a few exceptions measured at intervals of 6 months. They fall into several groups: (*a*) 18 anthropometric variables; (*b*) 6 measurement ratios, *e.g.*, chest breadth/stature; (*c*) 9 measures of physical activity, *e.g.*, coordination, as determined by a physician's and by teachers' ratings; (*d*) 12 autonomic variables; (*e*) 16 illness-diet variables; (*f*) 24 metabolism-hormone-increment variables.

Intellectual and School Variables.—(*a*) Intelligence: the Stanford-Binet test of intelligence was given annually for 3 years. (*b*) Translating experiment: in a study of the child's ability to "go back and forth between the abstract and the concrete," subjects were given the task of making designs on paper in accordance with instructions that were given first orally, then in written form, and then by means of example; 16 different measures were obtained. (*c*) General concepts experiment: in a study of what general concepts children use to organize their experiences, subjects were presented with a large array of everyday objects in miniature with instructions that they group them according to "what things belonged together"; the data were analyzed with respect to 87 different categories or types of concept such as structure, color, form, material, etc. (*d*) School grades: grades in 11 different school subjects were available at 2½-month intervals. (*e*) School abilities: 46 different school abilities, such as logical, practical, observant, talkative, etc., were rated by teachers once each year for 3 successive years.

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* Since the variables that enter into the patterns to be discussed below are there defined, we need only indicate here the scope and variety of the factors studied.

Variables of Personality and of the Environment.—All the variables of these two groups were defined in conformity with the theory put forward by Murray (4), who writes as follows:

> The scheme is based upon a conception of the mutual dependence and interaction of forces—forces within the personality and forces originating in things or people outside the personality. The forces engendered within the personality have been termed *needs* (or drives) and the social or inanimate forces with which the subject has intercourse have been termed *press* (plural press). It seems that almost any behavioral event is susceptible of analysis into needs and press; the interaction of the two being termed the *thema*, or dynamic skeleton, of the event. . . . The first task, then, is to identify the most important needs . . . and to identify the most important press.

(*a*) Needs: for describing overt behavior, or the manifest personality, there were 32 classes of needs (motivational dispositions) such as the need for Dominance (*n* Dominance), *n* Aggression, *n* Retention, *n* Seclusion. In addition, there were 11 "general traits," such as Impulsivity, Intensity, and Emotionality. The measures of these variables were ratings by teachers and by three psychologists. (*b*) Press: just as needs are classified according to the type of effect which the person achieves or toward which he strives, so press are classified according to the kind of effect which is exerted or might be exerted upon the person. Fifteen press which had been distinguished and named by Murray (3) were treated as variables in the study. These included press Dominance (*p* Dominance), *p* Aggression, *p* Nurturance, *p* Rejection, etc. An experimenter conducted periodic interviews with parents and teachers and, on the basis of the large amount of clinical material obtained, estimated on a scale the degree to which each of the classes of press was operating in the child's environment. (*c*) Manifest needs and covert needs: a distinction was made between manifest needs, which lead to activity which is seriously (adaptively) engaged with actual objects, and covert needs, which without expressing themselves directly in overt behavior give rise to such subjective phenomena as desires, dreams, and phantasies. It was assumed that needs belonging to each of the 32 classes might express themselves both overtly and covertly and that it was possible to estimate in each subject the amount of manifest need and the amount of covert need. For obtaining estimates of the latter and knowledge of the contexts in which they occurred, the subjects were given the Thematic Apperception Test (2) annually for 3 years. In this test the subject was presented with a series of dramatic pictures, such as that shown in Fig. 1, and asked to make up a story about each of them. The content of the stories was analyzed in terms of needs, press, and outcomes. The actions of the hero or principal character of a story were taken as manifestations of needs, while press were the environmental forces of which he was the object. The interactions of needs and press resulted in outcomes which could be classed as either good (success, satisfaction) or bad (failure, frustration). The procedure was to identify all the needs, press, and outcomes that were present in a story or set of stories and to estimate, on a 1–5 scale, the frequency and intensity with which these appeared.

An example will illustrate this procedure. The following story was produced, in response to Picture 16, by a thirteen-year-old girl. The needs and press which seem to be reflected in each distinguishable event of the phantasy have been noted and ratings based on all manifestations of each variable have been assigned.

roundings, and *n* Autonomy, *n* Abasement). He was going to try anyway (*n* Autonomy and *n* Inviolacy). He got a rope (*n* Acquisition) and started to climb up the wall of the prison (*n* Autoomy).

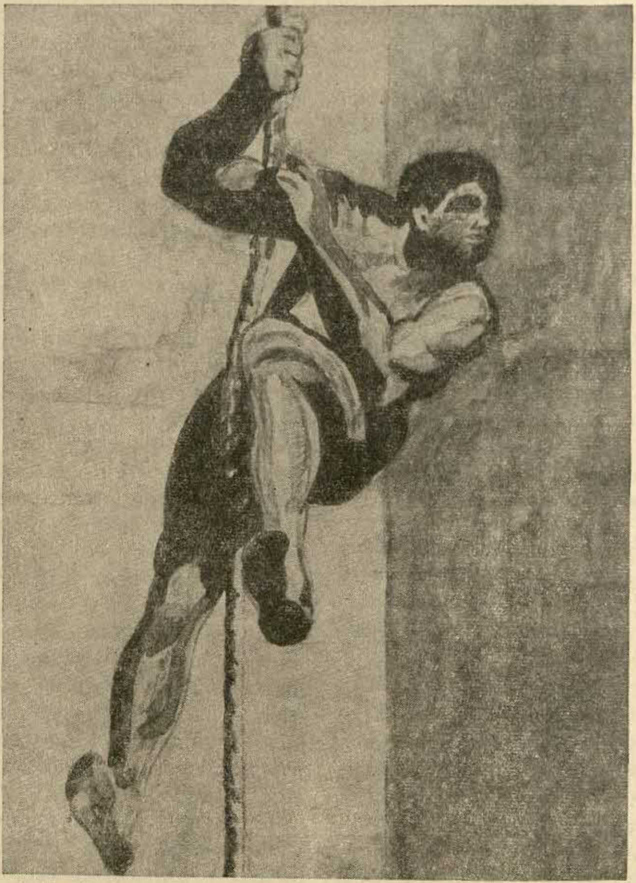

FIG. 1.—Thematic Apperception test, picture 16. (*From H. A. Murray, Explorations in Personality. New York: Oxford University Press,* 1938.)

This bandit (*n* Acquisition and *n* Aggression) got put in jail (*p* Dominance, *p* Aggression, and *p* Blame), and he kept trying to get away (*n* Autonomy, and *n* Blamescape). They made harder rules and gave him less freedom and less comfort (*p* Dominance, *p* Aggression, and *p* Retention). The monotony was making him mad (*p* Lack, *p* Affliction). He had rather be shot than live in this awful dungeon (*p* Noxiance, *p* Disorderly Sur-

There was a big searchlight and when it was turned off him he started up (*n* Seclusion and *n* Autonomy). Then it turned and they saw him—all the jailers were after him (*p* Knowledge, *p* Dominance, and *p* Aggression). He was crafty. He kept dodging and they couldn't shoot him (*n* Seclusion and *n* Harmavoidance). Finally they shot the rope (*p* Aggression) and he fell and was killed on the cement floor. (Bad Outcome: Death).

Need Ratings	
n Autonomy	4
n Blamescape	3
n Rejection	2
n Harmavoidance	2
n Aggression	2
n Abasement	2
n Inviolacy	1
n Acquisition	1
n Seclusion	1

Press Ratings	
p Dominance	3
p Aggression	3
p Blamavoidance	2
p Retention	2
p Lack	2
p Noxiance	1
p Disorderly Surroundings	1
p Knowledge	1

Scores for any group of stories were the totals of the marks assigned each variable in the scoring of the single stories. The productions of different children could be compared directly when appropriate steps had been taken to hold constant the amount of material produced by each of them.

Treatment of Data. *The Single Variable.*—Each variable of the first three groups was, of course, studied in relation to age, but, as stated above, the main concern of the study was the relationships among the variables themselves. What patterns of the variables could be discovered? For discovering relationships between variables it was necessary to rule out the effects of age. For accomplishing this purpose a simple graphic method was used to select subjects who were outstanding, *i.e.*, high or low for their age. Each variable was plotted against age. On each of these graphs a line (*AB*) was drawn to represent what seemed to be the general trend with age, its shape being determined by the median points for the several age groups. Two other lines (*CD* and *EF*) were drawn roughly parallel to *AB* in such a way that 27 per cent of the subjects fell above line *CD* and 27 per cent fell below line *EF*.* The former subjects were seen to be high for their age, the latter subjects low for their age, while subjects falling between lines *CD* and *EF* were average or medium for their age. Coefficients of correlation were then estimated from these tails of the distributions, our method (the "high-low" method) having been suggested by the work of Flanagan (1).

The Syndrome.—The correlation technique afforded a generally satisfactory method for determining whether or not two variables were related. The conception of the child as an integrated whole, however, called for something more than a description of several thousand relationships between isolated pairs of variables. As stated earlier, we sought to bridge the gap between this type of study—the familiar two-variable approach—on the one hand, and the individual case study on the other. The achievement of this aim seemed to require that our variables be grouped into meaningful patterns. Proceeding toward this end we treated separately at first the four fields: the physiological and anthropometric, the personality, the intellectual and educational, and the home-environmental. All the variables within each of these fields were intercorrelated. On the basis of these correlations groups of meaningfully interrelated variables were identified and termed "syndromes." We then sought to determine whether syndromes from one field were significantly related to syndromes from the other fields.

Method for Constructing Syndromes. In constructing a syndrome the first step was to examine the table of correlations, among the variables of a given field, for groups of significantly intercorrelated variables. The first rule was that each variable of a syndrome had to correlate at least ±.30 with each of the other variables and that all variables meeting this requirement were to be included. If the results of this procedure were unsatisfactory—if there were many syndromes that seemed psychologically unintelligible or too nearly duplicated other syndromes —then the lowest acceptable correlation was raised from ±.30 to ±.40, in one instance to ±.50. When groups of significantly intercorrelated variables had been found, the next step was to identify the subjects who best exemplified these patterns, *i.e.*, who stood at the extremes when the variables were considered in combination. Since each syndrome was later to be correlated with other syndromes, by the high-low method, the practice was to identify the 27 per cent of the subjects who stood highest on the syndromes and the 27 per cent who stood lowest. This was done by combining the subjects' scores, or rather, their "standings" as high, middle, or low, on the several variables.

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* Twenty-seven per cent is the proportion required by the procedure employed for estimating correlation coefficients.

By applying this procedure for constructing syndromes to the intercorrelations among the 43 manifest personality variables, we may at once illustrate the procedure and set forth some of the results obtained. The personality variables here considered are as follows:

Needs

n Abasement: To comply, surrender, accept punishment. To apologize, condone, atone. To depreciate oneself. Masochism.

n Achievement: To work intensely and persistently toward a goal.

n Acquisition: To take, snatch or steal O's.[*] Greedily to work for money or "goods." To bargain or gamble. To want possessions.

n Affiliation: To be sociable. To make friends. To love.

n Aggression: To fight. To criticize, blame, accuse, or ridicule maliciously. To injure or kill. Sadism.

n Autonomy: To resist coercion. To be free and independent.

n Blamavoidance: To avoid blame by inhibiting asocial impulses. To fear censure, ostracism, or punishment. To be well-behaved.

n Blamescape: To escape blame by flight or by concealment of guilt.

n Cognizance: To observe, inquire, explore, and investigate. To acquire facts.

n Construction: To organize and build things. To produce.

n Counteraction: To restrive after failure and to overcome weakness.

n Defendance: To defend the self verbally against blame or criticism.

n Dominance: To influence or control others. Leadership.

n Deference: To admire and follow a superior allied O.

n Excitance: To seek adventure and excitement. To enjoy thrills, new sensations, drama.

n Exhibition: To attract, excite, seduce, stir, amuse, entertain others. Self-dramatization.

n Exposition: To relate facts. To explain, judge, interpret.

n Harmavoidance: To avoid or flee from danger. To fear injury, illness, or death. To hide or take protective measures.

n Infavoidance: To avoid shame. To escape failure or humiliation.

n Inviolacy: n Counteraction + *n* Defendence.

n Knowledge: n Cognizance + *n* Understanding.

n Nurturance: To nourish and protect a helpless O. To express sympathy. To mother a child.

n Nutriance: To seek food and drink.

n Order: To get things in order. To achieve cleanliness, arrangement, organization, balance, neatness, tidiness, and precision.

n Passivity: To be relaxed and inactive. To receive benefits without effort. To allow others their way.

n Play: To relax tension and alleviate stress by pleasurable and humorously irresponsible activity—motor, verbal, or mental.

n Recognition: To seek praise, appreciation, honor, fame.

n Rejection: To exclude or scornfully ignore inferior O's.

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[*] "O" is the abbreviation of "object."

n Retention: To retain possession of O's. Economy, frugality, miserliness. To defend property.

n Seclusion: To be alone or inconspicuous. To maintain privacy.

n Sentience: To enjoy sensuous pleasures—sights and sounds.

n Sex: To seek sex objects. To court, to enjoy intercourse.

n Succorance: To seek aid, protection, or sympathy.

n Understanding: To think out explanations, develop logical relations, work out plans of procedure.

GENERAL TRAITS

Anxiety: Startledness, apprehension, timidity, worry.

Creativity: Manifest ability to produce and develop ideas.

Conjunctivity: Coordination of action and thought; organization of trends and purposes. The opposite of Conjunctivity is *Disjunctivity.*

Emotionality: The amount of emotion, affection, and autonomic excitement that the subject manifests. The opposite is *Placidity.*

Endurance: Duration of behavioral trends. Persistence and conative perseveration. The opposite is *Transience.*

Endocathection: The cathection of thought or emotion for its own sake. Preoccupation with inner activities. The opposite is *Exocathection.*

Impulsion: The tendency to think quickly without reflection. The inability to inhibit impulses. The opposite is *Deliberation.*

Intensity: Strength of effort, force of movement, power of expression. The opposite is *Apathy.*

Intraception: An imaginative, subjective, human outlook. Romantic action. The opposite is *Extraception.*

Projectivity: The tendency to project unconsciously one's own sentiments, emotions, and needs into others. To maintain wish-engendered beliefs. The opposite is *Objectivity.*

Sameness: Adherence to certain places, people, and modes of conduct. Persistence of purpose, consistency of conduct, rigidity of habits. The opposite is *Change.*

The intercorrelations among these variables were brought together in a table. The first step toward the discovery of manifest personality syndromes was to examine this table for groups of intercorrelating variables. The rule in this case was that each variable of the syndrome had to correlate .40 or more with each of the other variables and that the arithmetic average of the intercorrelations had to be .50 or more.* All variables that met these requirements were to be included. To take an example, inspection of the table showed that the variables *n* Blamavoidance, Conjunctivity, Endurance, *n* Achievement, *n* Counteraction, and *n* Order correlate one with another to the extent of .46 to .84 (average $r = .66$) and that no other variable correlated as high as .40 with all of them. The six variables taken together therefore met the requirements of a syndrome, and one could be sure that a considerable number of subjects had fairly similar standings on all of them. Examination of the distribution of subjects on each of the variables showed that five subjects were high on all of them, three subjects were high on five and middle on one, and four subjects were high on four and middle on three. These 12 subjects, then, constituted the 27 per cent who stood highest on the syndrome. In a similar fashion the 12 (27 per cent) subjects who stood lowest on the syndrome were selected. Thus we were provided with the high and low subjects for correlation purposes, and at the same time attention was focused upon children who had a fairly complex personality pattern in common.

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* It seemed that it would make for clarity in the further statistical treatment and in the discussion of these data if we limited ourselves at first to groups of variables that were positively intercorrelated. For the population involved, a correlation of .03 is near the lower limit of statistical significance, *i.e.*, there are 97 chances in 100 that the true correlation in the population of which our subjects are a sample is greater than zero.

The Selection of Syndromes.—The procedure just described yielded, for each field of the study, a large number of syndromes. Thus, for example, there were 40 manifest personality syndromes of the type just considered. For further treatment and discussion the number had usually to be decreased somewhat. The procedure here varied slightly, depending upon the type of variable involved, but always the aim was to discover syndromes which differed as much as possible from one another and whose components showed the highest degrees of intercorrelation. In many cases, picking out the children who best exemplified the syndrome helped in making decisions. If the subjects best characterized by two or more syndromes were much the same—and this was necessarily the case when the syndromes had a large proportion of variables in common—then combination was in order, for, though the differences in the compositions of the syndromes might have some theoretical significance, they were of no practical importance when it came to correlating a syndrome with those from other fields. By our methods the correlation depended upon the subjects present in the extremes of the distributions; hence, if these subjects were almost identical for two syndromes, all correlations of these syndromes with other variables would be alike. In such cases, either the two or more syndromes were combined or the largest and most significant was chosen to represent the general cluster of variables in question.

The procedure by which the 40 manifest personality syndromes were reduced to 20 major syndromes was as follows. First, syndromes that were similar in composition were grouped for further consideration. Thus not only the syndrome discussed above (Syndrome 1) but also the following were found:

2. *n* Blamavoidance, Conjunctivity, Endurance, *n* Achievement, *n* Counteraction, Objectivity.
3. *n* Blamavoidance, Conjunctivity, Endurance, Deliberation.
4. *n* Achievement, Conjunctivity, Endurance, Objectivity, *n* Construction.
5. *n* Achievement, Conjunctivity, *n* Order, *n* Understanding.

These syndromes are fairly similar in composition, and from inspection it appeared that combination might be in order. The procedure followed here, as in all similar instances was, first, to identify the 12 subjects (27 per cent) who ranked highest and the 12 subjects (27 per cent) who ranked lowest on each combination of variables. Then each syndrome was compared in terms of subjects with those most similar to it as regards component variables. In cases where the subjects who best represented two or more syndromes were much the same, as was true of the patterns we are considering, combination was performed according to the following rule: The group of variables that appeared in two or more of the syndromes was regarded as the most basic and significant syndrome, and to this were added variables, from the other syndromes, in case the following condition was met: that no subject who was at one extreme on the central syndrome was at the other extreme on the variable in question.

The application of this procedure in the case of Syndromes 1 to 5 yield the following major syndrome:

A. *n* Blamavoidance, *n* Order, Deliberation, Conjunctivity, Endurance, *n* Achievement, *n* Counteraction, and *n* Understanding or *n* Construction (average $r = .58$),* a pattern that came to be termed "Conscientious Effort."

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* Average r refers to the average of the intercorrelations among the several variables that go into the syndrome—not to the average of the correlations between single variables and the syndrome as a whole. In the present case *n* Understanding and *n* Construction, either one of which—but not both together—meets the requirements for membership in the syndrome, are not included in the calculations.

The decision as to whether or not two syndromes should be combined sometimes had to be made arbitrarily in accordance with the experimenter's judgment. If it seemed that the combination would obscure important differences among the subjects, and if there was theory at hand to explain the original coalitions of variables, then they were not combined but treated separately. In short, whereas the single personality variable was too specific for our purposes, the largest possible statistical clusters seemed too general. The syndromes that were finally distinguished were on the level of description that seemed to carry the most meaning.

The other major manifest personality syndromes which resulted from the combination of syndromes in the original group of 40 are as follows. Each has been given a name which is intended to represent what appears to be the content common to the variables of the syndrome.

B. Undisciplined Achievement: *n* Achievement, Intensity ($r = .54$).

C. Guilt and Remorse: *n* Blamavoidance, *n* Abasement ($r = .42$).

D. Willing Obedience: *n* Blamavoidance, *n* Deference ($r = .54$).

E. Ascendance: *n* Dominance, *n* Aggression, *n* Acquisition, *n* Autonomy, *n* Recognition, *n* Cognizance, *n* Defendance, *n* Exhibition, *n* Excitance, Intensity (ave. $r = .59$).

F. Aggressive Self-defense: *n* Defendance, *n* Rejection, *n* Autonomy, *n* Blamescape, *n* Aggression, *n* Retention, *n* Acquisition, *n* Dominance, Projectivity (ave. $r = .59$).

G. Self-sufficiency: *n* Rejection, *n* Seclusion, *n* Retention (ave. $r = .50$).

H. Counteractive Endocathection: *n* Counteraction, Endocathection ($r = .46$).

I. Timid Withdrawal: *n* Infavoidance, *n* Harmavoidance, Anxiety (ave. $r = .52$).

J. Placid Immobility: *n* Passivity, Apathy, Sameness, Placidity (ave. $r = .46$).

K. Passive Timidity: *n* Passivity, *n* Harmavoidance ($r = .46$).

L. Sensation: *n* Exhibition, *n* Excitance, *n* Cognizance, *n* Recognition, *n* Sex, *n* Succorance, *n* Exposition, *n* Blamescape, *n* Defendance, Projectivity, Impulsivity, Emotionality, Change (ave. $r = .57$).

M. Anxious Emotional Expressiveness: *n* Exhibition, Projectivity, Impulsivity, Anxiety, and Emotionality or Disjunctivity (ave. $r = .56$).

N. Timid Dependence: *n* Succorance, *n* Harmavoidance, Projectivity (ave. $r = .66$).

O. Lively Self-expression: *n* Play, *n* Exposition, Impulsivity, Change (ave. $r = .48$).

P. Good Fellowship: *n* Affiliation, *n* Play ($r = .57$).

Q. Social Feeling: *n* Affiliation, *n* Nurturance, *n* Deference (ave. $r = .54$).

R. Orderly Production: Creativity, Endurance, *n* Counteraction, *n* Order, *n* Construction (ave. $r = .52$).

S. Colorful Intellectual Self-expression: Creativity, *n* Understanding, *n* Exposition, Change, Intensity (ave. $r = .57$).

T. Sensitive Imaginative Creation: Creativity, *n* Sentience, *n* Understanding, Endocathection, Intraception, Change (ave. $r = .54$).

The Interpretation of Syndromes.—When syndromes in the several fields of study had finally been selected the attempt was made to describe them in clinical terms and to explain them in terms of underlying factors. To take an example, in the case of Conscientious Effort there is organized and persistent exertion to accomplish what is socially favored, and when obstacles are encountered there is renewed effort. In the present group of subjects it seems that the syndrome best characterizes those children who perform with diligence their various school tasks. There is the feeling that it is right to do these things, and to some extent at least the subject takes pride in doing them. The syndrome denotes firmness, organization, and persistence of action and the capacity for living and working in accordance with standards. Underlying this picture, it may be supposed, there is considerable inner structure of personality. According to theory, such a structure may exist either in the form of a well-integrated "superego" or in the form of a well-integrated "ego."* It seems that in the present syndrome both of these factors are at work: that a strong superego might manifest itself as conscientious effort in order to measure up to standards imposed by the community and so to avoid blame or guilt feelings (*n* Blamavoidance); or that a strong ego leads to similar behavior, with the underlying object of raising or maintaining the level of self-respect (*n* Achievement, and *n* Counteraction). We might suppose further that in the present instance the two forces are working in harmony: that the subject takes pride in—gains self-respect by—living up to the standards of the community.

On Conscientious Effort, as on each of the major syndromes discovered, high and low subjects were picked out so that the syndrome in question might be correlated with the other syndromes from the same and different fields. This amounted to treating the syndrome as if it were something unitary, a higher order variable to which a number of variables, of different degrees of complexity, had been reduced. A plausible interpretation in such a case would be that there was some one central factor which expressed itself in several different ways; that the several intercorrelating variables were but different measures of the same thing. This type of interpretation seemed best adapted to many of our syndromes, especially those in case of which the constituent variables were highly intercorrelated. But there was another conception which guided our interpretation of syndromes: the notion of a pattern of dynamically related factors. Such a pattern might be made up of factors which correlated .00 in the general population; conceivably it could exist in one and only one individual. Its existence, in such an instance, would be demonstrated when the experimental variation of one constituent in the individual led to variation in the others. Clinical observation of an individual, though it cannot provide proof of the existence of a syndrome of this type, often provides evidence that points definitely in that direction. When one is working with common factors, *i.e.*, factors which are conceived to be present in varying degrees in all members of the group under study, it is to be expected that some patterns of these factors will be fairly common, in which case the constituent variables will be intercorrelated to a noteworthy degree. Conscientious Effort was regarded as a pattern of this type. Though we were led to hypothesize underlying factors which made the variables of this syndrome go together, we were led at the same time to consider two additional—and as it seemed, highly important—facts: first, that no two children exhibited the syndrome in precisely the same way; and, second, that variables which appeared in this syndrome also appeared in others.

To consider the first of these facts: a syndrome could be observed to vary from one individual to another not only according to the relative predominance in them of the variables in the syndrome but also according to what other variables were operating in the subject. For example, most of the subjects who were high on the Conscientious Effort syndrome were high on *n* Understanding or *n* Construction or on both. These two variables, however, are correlated only .34. The interpretation was that there were two different fields of endeavor—the manual and the intellectual—in which conscientious work might be done. Again, Objectivity turned out to be significantly correlated with all the variables of the Conscientious Effort syndrome save *n* Order and hence might have been considered in general as a part of the picture. However, there were two subjects who were well characterized by the syndrome as a whole—including high *n* Order—but were at the same time highly projective. These subjects (both were girls) could be described as *over*conscientious and perfectionistic, so anxious were they to avoid or correct, as the case might be, the slightest error. So great were their premonitions of failure that when they were right it was not easy for them to be convinced of it. In these subjects, it seemed that there was too much superego and that it was not well integrated with the ego. Similarly, it was of interest to note that in some subjects Conscientious Effort appeared to be associated with Anxiety and in others with low Anxiety, that in some subjects Conscientious Effort was associated with Creativity and in others with low Creativity, etc. On a purely clinical basis it was possible to distinguish numerous variations in the Conscientious Effort pattern, or numerous relatively individualistic patterns to which the variables of that syndrome belonged. It seemed, however, that we would single out what was most significant and be at the same time on firmer ground if we paid most attention to variables, such as Objectivity and Creativity in the present example, which were actually correlated to some noteworthy degree with the syndrome.

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* The concept of "superego" is here understood as the intrapsychical representative of the customs and ideals of the community. The "ego" in the commonly accepted sense of the term is the discriminating, reasoning, resolving, and most self-conscious part of the personality.

The fact that the same variable often appears in several different syndromes is due to the method of analysis employed. We could, of course, have carried out the statistical treatment of our data in such a way as to arrive at a set of nonoverlapping clusters. But the present arrangement is one that seemed to accord both with clinical observation and with the basic assumptions that guided our study. It is a matter of common observation in clinical practice that a factor which appears as a part of one pattern in some children may appear in quite a different connection in others; and this is the observation behind the assumption that every variable in a person exists in a context of variables and can be adequately appraised only if the context is taken into account. The procedure that we followed seemed to allow us to deal with this state of affairs. For example, in the illustration we are using *n* Blamavoidance is an important feature of the Conscientious Effort pattern. The picture here presented is quite different from that which develops when *n* Blamavoidance appears in connection with Guilt and Remorse or in connection with Willing Obedience. Further, according to the doctrine that the organism functions as a whole, we might expect to find that there are in the person few, if any, strictly independent components such as might be inferred from a set of nonoverlapping clusters. Indeed, clinical observation repeatedly gives evidence that even though the variables of a cluster be very highly intercorrelated it is always possible to find a subject, or subjects, in whom one of these variables is dynamically related to one or more variables from another cluster.

Syndromes of the type discussed above were by no means all that could be distinguished with the use of our data. As pointed out above, a syndrome —a pattern of dynamically related factors—may exist in some subjects even though the constituent variables intercorrelate .00 in the total population. Patterns of this kind were readily to be observed in some of our subjects. For example, the variables *n* Dominance, *n* Nurturance, and *n* Exposition intercorrelate, on the average, .12 and no two of them appear in the same one of the above syndromes, yet these variables formed a pattern which was plainly to be observed in several of our girls—a pattern of "grown-up" dominating protection and guidance where other children were concerned. Patterns of these kinds were innumerable. They received scant attention only because they seemed less important than the common syndromes.

Interrelations of Syndromes.—The type of analysis applied to our manifest personality variables was applied to the quantitative data from each of the other fields of study. When these analyses had been completed we were in a position to approach our major problem: What were the common patterns of relationship among *all* the physical, intellectual, personality, and environment variables used in the study? In coming to grips with this problem the first step was to correlate each of the major syndromes from each field with each of the major syndromes from the other fields. Thus there were to be considered six main types of interrelationship, or six main groups of intercorrelations: physical-intellectual, physical-personality, physical-environment, intellectual-personality, intellectual-environment, and personality-environment. When two syndromes from different fields intercorrelated we had already to deal with a complex pattern of multiple variables—something that called for interpretation and explanation. And more than this, we had to deal with groups of intercorrelating syndromes and to consider the question of what general factors might underlie these broader patterns.

Intercorrelations among syndromes could, of course, reveal only those patterns which were common. We were interested also in some of the more unique constellations that had reality and meaning when the children who exemplified them were considered. Usually when two syndromes were intercorrelated, let us say to a degree approaching statistical significance—.40 or thereabouts—there was a group of subjects who did not go with the majority. Their failure to do so could be attributed, it seemed, to the operation of other factors, factors which acted to offset the effects of those under consideration. It was therefore of interest to note whether these children appeared together in any other syndrome or syndromes. This type of search sometimes led to the discovery that there were small groups of children who appeared together again and again, who were similar, that is, in numerous respects. And it was possible to hypothesize certain basic factors that they had in common. In general, however, the more numerous were the syndromes that could be fitted into the developing picture, the fewer were the subjects who perfectly exemplified it. Since it was not our object fully to consider individuals, there was a limit to how far we could carry this type of exploration.

Results

Organization of Results.—The remainder of this paper presents some of the patterns and interrelationships discovered in the study and illustrates the manner in which results of these kinds were interpreted.

In considering interrelationships any syndrome, from any field, could have been taken as a point of departure. If we were not to go off in all directions at once, however, one approach had to be decided upon and maintained. It seemed reasonable, and in certain respects practically advantageous, to start with what appeared on the surface, *i.e.*, with overt behavior. This was to start from the point of view of the teacher, who observes patterns of behavior, behavior in learning situations particularly, and asks for explanations. Such explanations are usually sought in the realm of the child's intelligence, his underlying personality needs, his physiology, and his family background.

Accordingly, in our attempt to integrate the mass of data the main emphasis was upon (*a*) manifest personality patterns in their relations to all the other types of syndrome discovered and (*b*) syndromes of school abilities and of school grades considered in relation to various possible determiners. We shall be concerned here only with the former of these two areas. The approach to this area was to group those manifest personality syndromes which it seemed might effectively be discussed together—either because they intercorrelated or because they belonged to the same theoretical context—and to note the significant correlations with intellectual syndromes, phantasy syndromes, physical syndromes, and syndromes of family press. Six such groups—very broad and very loose personality patterns—were distinguished: The Structured Personality, Active and Inactive Children, The Social Being, the Timid Child, The Sensitive Creator, and the Sensation Seeker.*

The Structured Personality.—The first of these broad patterns, The Structured Personality, may now be considered in detail. After describing the pattern we shall turn to the correlations between the syndromes of this group and syndromes from other fields. Then we shall consider some of the less common and more complex patterns which emerge when we take the subjects best representing one of our personality syndromes and inquire how these subjects differ among themselves and how they may further be grouped according to additional syndromes that they exhibit in common. Having passed through this intermediate stage between the purely quantitative and the purely clinical we shall, finally, consider two individual children who seem to show personality structure.

The Meaning of Personality Structure.—The pattern to be considered centers about Conscientious Effort and comprises in addition manifest personality syndromes with which, for the most part, it is positively correlated: Orderly Production, Counteractive Endocathection,† Self-sufficiency, Guilt and Remorse, and Willing Obedience. With several important exceptions each of these syndromes tends to correlate significantly with each other and to yield similar correlations with syndromes from other fields. In electing to discuss these syndromes together, however, we were guided not only by the correlations but by considerations of theory. The syndromes focus attention upon two hypothetical constructs which, in our earlier consideration of Conscientious Effort, were evoked to aid in its understanding: ego strength or structuration, and superego or internalized moral forces.

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* These terms were regarded as convenient designations. The fact that they are terms which might appropriately be applied to a child, or to a kind of child, was not intended to imply that the patterns discovered were actually types or that they could, in any strict sense, be treated as such. When a child exhibited to a marked degree one of these patterns one could, for purposes of discussion, speak of "that type of child," but this was not to say that he did not exhibit other patterns at the same time.

† It has not been possible to find an appropriate term for this combination of variables. Perhaps "inner life" is the most important feature of the picture. The subject in whom this pattern is marked does not when subjected to belittlement retaliate with defensive talk or action (Aggressive Self-defense) but assumes rather an attitude of reserve and dignity—perhaps later to find a way to vindicate himself. The pattern resembles Self-sufficiency in that both involve withdrawal from social or competitive activities, but there is a noteworthy difference between the two: in Counteractive Endocathection but not in Self-sufficiency there is inner life—phantasy, intellectual activity—into which the subject might retreat when he found himself rebuffed by his environment and which might be a source of satisfaction for him on other occasions as well.

By conceiving of various types of relationship between these two forces or underlying reaction systems it is possible to understand the present syndromes as variations upon a central theme. In Conscientious Effort and Orderly Production the two would seem to be working in harmony. Here we find the highest degree of integration: the subject pursues without anxiety but with order and determination socially approved lines of conduct. In Counteractive Endocathection there is inner strength without there necessarily being concern with moral behavior and principles—though in the present group of subjects the two go together—while in Self-sufficiency there is inner strength combined with a tendency toward withdrawal from other people. The Guilt and Remorse pattern lays particular stress on moral problems. There is conflict between moral force, the superego, and primitive impulses. The former is strong, as it must be to succeed in its purpose, and is thus a source of strength within the person. Willing Obedience is included here not because it denotes inner strength, but because it stands as another way for handling moral problems, that is, by submitting to admired authorities. If there is structure in the subject's reactions it arises from his environment, not from within his personality.

The Correlates of Personality Structure. A. Personality Structure and Intellectual Patterns.—Correlations of the present manifest personality syndromes with intellectual syndromes, phantasy syndromes, physical syndromes, and syndromes of family press, together with the intercorrelations among the latter, are given in Table 1.

The study of school abilities and school grades in relation to the present personality syndromes shows that Conscientious Effort and Orderly Production, though not notably related to Mental Age (.12, and .16), are highly correlated with general excellence of school grades (.67 and .70) and with abilities involving persistence and workmanship: Conscientious Effort and Orderly Production correlate .40 and .75 respectively with the Art-Technical Ability syndrome, a pattern made up of the variables Creative in Art, Spatial Sense, Mechanical and Manipulative Skill, and Planning; they correlate .73 and .59 respectively with the Workmanship syndrome (Thoroughness, Finished Production, Planning, Concentration). Counteractive Endocathection, which correlates .37 with Mental Age, seems to relate more highly than the other personality patterns with those school abilities which seem to reflect inner life and emphasis on the things of the mind: there is a correlation of .63 with the Abstract Thinking syndrome (Logical, Forms Generalizations, Applies Generalizations, Sees Relationships, Causal Sense, Analyzing Ability), a correlation of .56 with the Intellectual Power syndrome (Learning Ability, Mental Energy, Observant, Fund of Ideas, Confident Approach). Guilt and Remorse (*r* with Mental Age, −.37) correlates only with those school abilities in which carefulness is an important element: Workmanship .48, grades in Spelling-Handwriting .38. Willing Obedience shows a marked negative correlation (−.50) with Mental Age but is related to those abilities in which conformity to technical requirements is effective: Workmanship .40, Art-Technical Ability .33, Spelling-Handwriting .30.

B. The Phantasies of the Structured Child.—The phantasy syndromes Strong Character, Ego Defense, and Attack correlate positively with most of the present manifest patterns. The so-called Strong Character pattern is composed of the variables *n* Blamavoidance, *n* Abasement, and *n* Inviolacy. If the heroes of a story showed these three needs in high degree we could speak of them as people of strong character. Such heroes respond to promptings within themselves. They

TABLE 1.—INTERCORRELATIONS OF SYNDROMES FROM DIFFERENT FIELDS

Syndrome	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1. Conscientious Effort	.....	.48	.75	.37	.63	.41	.67	.54	.48	.37	.40	.72	.46	.41	.16	.33	.41	.28	.22	.30	.30	−.67	.42	−.40	.12	−.10
2. Orderly Production	.48	.....	.48	.12	.06	.11	.70	.32	.52	.56	.75	.59	.23	.16	.10	.26	.40	.06	.12	.30	.24	−.44	.42	−.54	.16	.25
3. Counteractive Endocathection	.75	.48	.....	.52	.41	.12	.65	.48	.63	.56	.45	.55	.56	.40	.30	.46	.16	.05	.37	.24	−.05	−.41	.06	−.38	.37	−.19
4. Self-sufficiency	.37	.12	.52	.....	.30	−.16	.20	.27	.22	.06	.00	.00	.44	.33	.35	.52	−.06	−.06	.16	.16	−.48	−.20	−.40	.22	.05	−.53
5. Guilt and Remorse	.63	.06	.41	.30	.....	.69	.19	.38	−.16	−.26	.00	.48	.23	.33	−.23	.52	.12	.22	.06	.16	.00	−.34	−.16	.00	−.37	−.34
6. Willing Obedience	.41	.11	.12	−.16	.69	.....	.26	.30	−.11	−.11	.33	.40	.16	.12	.03	.08	.05	.28	−.11	.16	.41	−.24	.12	−.49	−.50	−.04
7. All School Subjects	.67	.70	.65	.20	.19	.26	.....	.70	.75	.82	.44	.51	.64	.11	−.11	.26	.24	.44	.24	.37	.48	−.29	.45	−.37	.55	.00
8. Spelling-Writing	.54	.32	.48	.27	.38	.30	.70	.....	.55	.43	.40	.20	.59	.33	.34	.36	.07	.26	.45	.54	−.22	−.07	−.15	−.16	.37	−.42
9. Abstract Thinking	.48	.52	.63	.22	−.16	−.11	.75	.55	.....	.87	.30	.19	.64	.05	.20	.20	.00	.24	.20	.20	−.05	−.24	.10	−.33	.75	.18
10. Intellectual Power	.37	.56	.56	.06	−.26	−.11	.82	.43	.87	.....	.37	.28	.52	.11	−.08	.24	.06	.33	.20	.26	.24	−.16	.37	−.28	.75	.18
11. Art-Technical Skill	.40	.75	.45	.00	.00	.33	.44	.40	.30	.37	.....	.61	.34	.00	−.11	.30	.30	.16	.48	.29	.30	.00	.28	−.48	.10	−.09
12. Workmanship	.72	.59	.55	.00	.48	.40	.51	.20	.19	.28	.61	.....	.23	.20	−.34	.56	.40	.40	.16	.24	.37	−.41	.60	−.48	.00	.00
13. Strong Character	.46	.23	.56	.44	.23	.16	.64	.59	.64	.52	.34	.23	.....	.44	.59	.10	−.08	.23	.44	−.06	−.07	−.16	−.06	−.40	.52	−.14
14. Ego Defense	.41	.16	.40	.33	.33	.12	.11	.33	.05	.11	.00	.20	.44	.....	.08	.16	−.19	.10	.00	.26	−.37	−.34	−.16	−.24	.00	−.63
15. Attack	.16	.10	.30	.35	−.23	.03	−.11	.34	.20	−.08	−.11	−.34	.59	.08	.....	−.38	−.19	.06	.18	−.21	−.25	−.28	.00	−.11	.04	.37
16. Tall, Thin	.33	.26	.46	.52	.52	.08	.26	.36	.20	.24	.30	.56	.10	.16	−.38	.....	.16	.23	.33	.67	−.14	.17	−.22	.25	.34	−.33
17. Coordination	.41	.40	.16	−.06	.12	.05	.24	.07	.00	.06	.30	.40	−.08	−.19	−.19	.16	.....	−.22	.11	.14	.45	−.19	.50	−.14	.05	−.31
18. Precocious Hormone	.28	.06	.05	−.06	.22	.28	.44	.26	.24	.33	.16	.40	.23	.10	.06	.23	−.22	.....	.24	.18	.37	−.12	.45	−.17	.23	.43
19. Parasympathetic Reactivity	.22	.12	.37	.16	.06	−.11	.24	.45	.20	.20	.48	.16	.44	.00	.18	.33	.11	.24	.....	−.10	.24	.24	.24	−.05	.30	−.34
20. Tight Control	.30	.30	.24	.16	.16	.16	.37	.54	.20	.26	.29	.24	−.06	.26	−.21	.67	.14	.18	−.10	.....	.05	−.53	.12	.00	.11	−.34
21. Acceptance	.30	.24	−.05	−.48	.00	.41	.48	−.22	−.05	.24	.30	.37	−.07	−.37	−.25	−.14	.45	.37	.24	.05	.....	−.33	.85	−.37	−.05	.20
22. Unstable Home	−.67	−.44	−.41	−.20	−.34	−.24	−.29	−.07	−.24	−.16	.00	−.41	−.16	−.34	−.28	.17	−.19	−.12	.24	−.53	−.33	.....	−.60	.20	.00	.16
23. Affectionate Training *vs.* Rejection, Poor Training	.42	.42	.06	−.40	−.16	.12	.45	−.15	.10	.37	.28	.60	−.06	−.16	.00	−.22	.50	.45	.24	.12	.85	−.60	.....	−.35	.10	.48
24. Disappointed Parental Ego Ideal	−.40	−.54	−.38	.22	.00	−.49	−.37	−.16	−.33	−.28	−.48	−.48	−.40	−.24	−.11	.25	−.14	−.17	−.05	.00	−.37	.20	−.35	.....	−.12	.13
25. Mental Age	.12	.16	.37	.05	−.37	−.50	.55	.37	.75	.75	.10	.00	.52	.00	.04	.34	.05	.23	.30	.11	−.05	.00	.10	−.12	.....	.00
26. Male Sex	−.10	.25	−.19	−.53	−.34	−.04	.00	−.42	.18	.18	−.09	.00	−.14	−.63	.37	−.33	−.31	.42	−.34	−.34	.20	.16	.48	.13	.00	

accept responsibility for their actions, inhibit antisocial tendencies, maintain high moral standards, and gain self-respect by putting themselves right with the demands of their culture. The Ego Defense pattern is made up of *n* Infavoidance, *n* Counteraction, *n* Defendance, *n* Seclusion, and *n* Understanding. The first three needs of this group seem to have the common aim of defending the self, usually against humiliation, insult, or belittlement. *n* Seclusion may further this same trend (a hero may avoid humiliation by remaining unobserved), or it may appear in response to an insult (the hero may solace himself in private). That *n* Understanding should be a part of this pattern seems largely attributable to the fact that in the stories of school children the situation in which humiliation occurred or threatened to occur was one involving school activities or some other kind of intellectual pursuit. The Attack syndrome comprises the three phantasy press: Aggression, Acquisition, and Autonomy. Here the heroes of a set of stories are the objects of some sort of aggressive attack by other people. Though *p* Aggression and *p* Acquisition often appear in stories in the form of attempts by the forces of law and order to track down a miscreant hero, the presence of *p* Autonomy in the present syndrome gives evidence that here the attack is usually a criminal one, a villain makes an aggressive-acquisitive attack on the hero or heroine and then tries to get away.

In these three phantasy patterns, then, it seems that the main emphasis is upon moral dilemmas and the responses of heroes to inner events. The highest correlations of these phantasy syndromes with the manifest personality syndromes we are considering appear in the cases of Conscientious Effort (.16 to .46), Counteractive Endocathection (.30 to .56), and Self-sufficiency (.33 to .44) and the lowest correlations appear in the case of Willing Obedience (.03 to .16). We are led to suppose that these phantasy trends and these behavior patterns are to a large extent expressive of the same underlying personality factors: a relatively structured ego and a superego that is becoming integrated with the Ego.

C. Physical and Physiological Correlates of Personality Structure.—All the manifest personality syndromes in our group, with the exception of Willing Obedience, are correlated positively (.26 to .52) with Tall, Thin Measurement, a pattern which comprises the intercorrelating measures Standing Height, Sitting Height, Trunk Height, Supra Sternal Height, Iliac Height, and Arm Span. The highest correlations with this type of physique appear in the case of those syndromes which express, according to our hypothesis, pronounced inner life or inner emotional conflict, namely: Counteractive Endocathection, Self-sufficiency, Guilt and Remorse.

Conscientious Effort and Orderly Production correlate significantly, .41 and .40 respectively, with Coordination, a syndrome made up of Coordination, Flexibility, Balance, Large Muscle Movements, Small Muscle Movements, Grace, and Few Extraneous Movements. Good Coordination seems to fit in well enough with these two personality syndromes and to contribute to a picture of smooth or harmonious functioning. One might suppose that the same inner structure—a superego that is well integrated with a strong ego—that gives rise to such traits as Conjunctivity, Endurance, *n* Order, and *n* Construction likewise promotes good physical coordination. At the same time it is reasonable to suppose that good physical coordination, present from the beginning, might be a factor which favors the development of a strong ego.

Conscientious Effort, Guilt and Remorse, Willing Obedience, and the phantasy syndrome Strong Character

—and only these from all our personality syndromes—show small positive correlations with the Advanced Hormone, Osseous Development syndrome (.22 to .28). This physiological syndrome is made up of the variables Androgen, Estrogen, Advanced Bone Age. Most of the variables which comprise these syndromes increase with age, and we may therefore think of these patterns as characteristic of our more mature subjects. In spite of the fact that the correlations are low, statistically not significant, they afford some slight evidence of the covariation of physiological and psychological maturity.

Several of the present personality syndromes correlate positively with the Parasympathetic Response syndrome (Flushing, Sweating, Skin Stroking Intensity, Palpable Thyroid, Sinus Arrythmia): Counteractive Endocathection .37, Strong Character .44, Conscientious Effort .22. These correlations would seem to give an indication that it is inner emotional life that is accompanied by this particular pattern of autonomic activity. One might venture the hypothesis that the subjects who exhibit these syndromes have emotions but strive to inhibit them, to keep them to themselves, so that the tension is discharged through flushing, sweating, etc., rather than through verbal or muscular action. It is noteworthy that Parasympathetic Response correlates negatively with all those manifest personality syndromes—Social Feeling, Good Fellowship, Lively Self-expression—in which social responsiveness or outgoingness is the central component. If the subject "lets himself go" emotionally, it seems, he is less likely to exhibit autonomic reactivity. Parasympathetic Response correlates .33 with Tall, Thin Measurement, the type of physique which seems to go with pronounced inner life rather than with social responsiveness. It is possible on this basis to compose a broader picture of inner life, tallness, thinness, and parasympathetic response and to contrast this picture with one of social responsiveness, shortness, wideness, and absence of parasympathetic activity. The correlations among the several syndromes are not high, but it is possible to pick out several subjects who exemplify in detail each of these broader pictures.

D. Personality Structure and Patterns of Family Press.—We may turn to a consideration of family press syndromes in relation to the present personality and physical patterns. It is to be noted, in the first place, that the syndrome Tight Control tends to be positively correlated with several manifest personality syndromes. Tight Control is a pattern made up of the variables *p* Dominance, *p* Nurturance, and *p* Retention; it describes a situation in which the parents keep their children close, supervise their training in every detail, insist upon their confidence, limit their experiences, guard carefully their physical well-being, maintain a strict regime, etc. This pattern correlates .30 with Conscientious Effort, .30 with Orderly Production, and .24 with Counteractive Endocathection. These correlations, though low, suggest that structure in the person might to some extent be due to structure in the home, that subjects who have been the objects of discipline are sometimes those best able to discipline themselves. Subjects who give evidence of this inner discipline, as we have seen, tend to be tall and thin rather than short and wide. In this light it is not surprising to find that the family pattern Tight Control correlates significantly (.67) with the physical syndrome Tall, Thin Measurement.

The Acceptance syndrome (*p* Affiliation, *p* Nurturance, *p* Deference) describes a situation in which the child is a favorite at home or is the object of a great deal of affection and appreciation; the home is a warm and happy center for the child; the parents side with the child, interpret his behavior favorably, acclaim his accomplishments. Acceptance correlates positively with Conscientious Effort (.30) and with Willing Obedience (.41) but negatively with Self-sufficiency (−.48) and the phantasy syndrome Ego Defense (−.37). Willing Obedience, it will be recalled, contains a large social component and is marked by a relative lack of inner structure. Self-sufficiency and the Ego Defense phantasy syndrome, on the other hand, are characterized by inner structure and a relative lack of social feeling. We can understand the negative relation of these two syndromes with Acceptance if we imagine a child who was not accepted saying to himself, "All right, if you won't care for me, I'll look after myself," and developing a strong Ego, but at the same time a measure of defensiveness and a relative lack of respect for social sanctions. The child who has been the object of marked acceptance, on the other hand, seems in the majority of cases to yield willingly to social pressure. We might suppose that he does so out of his need to maintain positive social relations with other people—to give as well as to win, or not to lose, love. Reverting now to the correlation between Conscientious Effort and Acceptance, we note that the subjects who are high on these two syndromes tend also to be high on Willing Obedience. (Of the six subjects who are high on both Conscientious Work and on Acceptance four are high on Willing Obedience and one other is high on Social Feeling.) This suggests the hypothesis that Conscientious Effort may result not only from inner structure or discipline, but from a desire to please and to maintain friendly relations with admired authorities. This desire would seem to be due, in part at least, to the influence of high Acceptance. The Affectionate Training syndrome (*p* Affiliation, low *p* Rejection, low *p* Capricious Discipline—an ordered, affectionate home life) yields correlations that are very similar to those which appear in the case of Acceptance. (The two syndromes correlate .85, it will be noted.) Acceptance and Affectionate Training both correlate positively (.45, .50) with Coordination. This serves to support the notion that Acceptance and Affectionate Training are patterns well calculated to promote smooth functioning, physical as well as psychological. Though they do not necessarily make for firm inner structure they act to forestall inner conflicts and thus contribute to efficient effort.

The family press syndromes Unstable Home and Disappointed Parental Idealism yield correlations with the present group of personality and physical syndromes that are to a large extent the obverse of those just considered. Unstable Home (*p* Capricious Discipline, *p* Excitance) gives a picture in which the parents are less reliable than the average; they are to a large extent incapable of steady, quiet discipline; they may stimulate the child to a high pitch one moment and at the next attempt discipline him for behavior that probably resulted from overstimulation. Disappointed Parental Idealism (*p* Dominance, *p* Aggression, *p* Eldest Child) is a pattern in which *p* Dominance and *p* Aggression center around the parents' Ego Ideal for a child. In the typical case the parents, out of their own ambition, hold before the child an ideal far out of his reach, and when he begins to show his inability to attain such a goal their disappointment leads to undue attempts to shape the child in such a way as to feed their own narcissistic pride. Unstable Home and Disappointed Parental Idealism correlate negatively (−.24 to −.67) with Conscientious Effort, Orderly Production, Willing Obedience, and physical Coordination. Both of them, it seems, are patterns of family press that operate to prevent or to interfere with integration and smooth functioning in the person. That Unstable Home should have this effect can be understood when we consider that this syndrome correlates negatively with Tight Control, Acceptance, and Affectionate Training, the patterns that we have found to be positively associated with social responsibility and efficient effort. This is the other side of the picture, as it were. That Disappointed Parental Idealism should correlate negatively with the personality syndromes involving inner structure and social responsibility is especially interesting when we consider that it is usually with the object of developing just such response patterns as these that mothers and fathers exhibit Parental Idealism. Pressure to induce high standards of achievement, far from attaining its end, seems more often to have an opposite kind of effect. Being an eldest child is one component of the present family press syndrome. In this case it would seem to be a most important feature. We can understand how an eldest child who was pushed to the front, required, perhaps, to set an example for his younger siblings, might well be made anxious by this situation and seek for some way out of it, like the man who is coached to set the pace in a marathon but is finally unnerved by the sound of his opponents' footfalls. With middle children it seems to be different. There are seven subjects who are low on Disappointed Parental Idealism but high on Conscientious Effort, and all of them are middle children. An hypothesis to explain this result would be that these subjects are moved to compete with their older siblings and, having more to gain than to lose—rich satisfaction if successful, a perfect excuse if unsuccessful—are able to exert their best efforts to this end.

Variations in Personality Structure: More Complex and Less Common Patterns.—These correlations are not enough to stand by themselves. For a better understanding of the effects of family influences upon personality and physical syndromes we must give consideration to individual subjects. Can we by having recourse to all that we know about the subjects who belong to a certain syndrome explain their presence in it? The present correlations offer guidance as to where we must look for the most important determining factors, but clinical facts must likewise be called upon.

From the present group of manifest personality syndromes let us take for consideration Conscientious Effort, the pattern that correlates significantly with all the others and is in a sense central to the group. Of the eleven subjects who are high on this syndrome five (Jean, Molly, Lois, Tom, Sally) are high on Tight Control. Of this group of five subjects three are high and only one is low on Acceptance. None of them is low (one is high) on Affectionate Training and none is high on Unstable Home (four are low) or high on Erotic Affiliation. Only one of them is high on Disappointed Parental Idealism (three are low). These results would seem to indicate that Tight Control, if it is exercised in a stable home and if it is accompanied by affection—affection that does not take the form of intense physical demonstrativeness (by a parent of the opposite sex especially) or of too great eagerness for the child to attain high standards of achievement—is favorable to Conscientious Effort.

Lois, a thirteen-year-old girl, presents the only exception to this rule, as far as the present group of subjects is concerned. She is the one subject from this group who is low on Acceptance, and also the one subject who is high on Disappointed Parental Idealism. In her case it seems that Tight Control, and perhaps low Erotic Affiliation, are the only factors favorable to Conscientious Effort that have been operating. It should be remarked that in none of our subjects has Tight Control been more extreme than in this case, and that in no other subject have we such an extreme picture of overconscientiousness. Not only is Lois high on Conscientious Effort but she is high on Guilt and Remorse, Anxiety, Infavoidance, and Projectivity. Afraid of making a mistake, afraid of being blamed, Lois is scrupulous to the point of being inefficient, so that in spite of the order and precision of her work she is in our low group on excellence of school grades.

Mention should be made of the eight subjects who are high on Tight Control but not on Conscientious Effort. Only two of them are *low* on Conscientious Effort. Neither of these two subjects is high on Acceptance or on Affectionate Training. One of them is high on Unstable Home; the other has been the object of a great deal of parental oversolicitude with respect to illness and, for a considerable period during her early years, of *p* Sex, influences which seem to have given rise to marked anxiety and disjunctivity.

Of the six remaining subjects high on Conscientious Effort, *i.e.*, those who are high on Conscientious Effort but not on Tight Control, four are high and none is low on either Acceptance or Affectionate Training. None is high (one is low) on Unstable Home or on Disappointed Parental Idealism (four are low). Three of these subjects, however, are low on Tight Control. Thus it would appear that Tight Control, though it sometimes favors Conscientious Effort, is by no means a necessary condition for this behavior pattern. The same type of behavior may result from affectionate care, so long as there is some discipline, some stability, and not too much insistence upon high standards of achievement.

If we consider further the two groups of subjects with which we have been dealing, *viz.*, those who are high on Conscientious Effort and on Tight Control as opposed to those who are high on Conscientious Effort but not on Tight Control, we note an important difference between them as far as other aspects of their manifest behavior are concerned. Of the subjects who are high on Conscientious Effort but not on Tight Control, four (Lora, Meg, Sally, Ben) are high on Social Feeling and two subjects (Chris, Burt) are high on Willing Obedience. Of the remaining subjects—those who are high on both Conscientious Effort and Tight Control—only one, Molly, is high on either of these syndromes. When we consider the phantasies of these children we note that the above two groupings of subjects are more or less maintained. Chris, Di, Meg. Lora, and Sally are high on either the (phantasy) Social or the (phantasy) Love syndromes or both. None of the other subjects is high on either of these syndromes; on the contrary, Jean, Tom, Molly, Lois, and Burt are high on either the (phantasy) Antisocial or the (phantasy) Attack syndrome or on both. From these results it is possible to make the formulation that Conscientious Effort is a response pattern which may spring from one or the other of two underlying conditions: (*a*) a stern superego that is fairly well integrated with the ego, or (*b*) an underlying need to win, or not to lose, love. Subjects in whom the former condition exists seem to be responding to the press of Tight Control; subjects in whom the latter trend is marked seem to be responding to the press of Acceptance or of Affectionate Training.

On the basis of the discussion thus far it is possible to divide our high Conscientious Effort subjects into two groups. One group, the "stern superego" group, comprising subjects Jean, Tom, Molly, Lois, and Burt,* the other group, the "love-guilt"† group, comprising subjects Chris, Di, Meg, Lora, Sally, and Ben. Are the subjects in one or the other of these groups alike in other ways? Subjects from both groups were high on numerous school ability syndromes but more subjects of the former, stern superego, than of the latter group obtained high grades in Handwork and Art Handwriting (4 to 2) and were high on Inadequate Receptivity (2 to 0), a response pattern that we have attributed to underlying anxiety. More subjects of the latter, were high on Art grades (4 to 1), Writing Ability (3 to 0), and Talking Ability (3 to 1). Thus in the more creative and expressive phases of schoolwork, it is the love-guilt group who excel while the stern superego group are concerned with form, order, and organization. In the General Concepts Experiment, the stern superego subjects tend to be objective (3 to 1), while the love-guilt subjects are subjective in their approach (4 to 1).

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* Burt does not fit this pattern as well as do the other subjects, inasmuch as he exhibits a desire to win love and has not been the object of Tight Control, but it is not misleading to place him here.

† The term "love guilt" has been taken from Rosenzweig (5).

Turning to the physical syndromes we have considered we note that of the four subjects high on both Conscientious Effort and Coordination three are in the love-guilt group, one in the stern superego group. The one subject who was high on Conscientious Effort but low on Coordination also belonged to the stern superego group. Of the four subjects high on both Conscientious Effort and Advanced Hormone three were high on stern superego, one on love guilt. The one subject who was high on Conscientious Effort but low on Precocious Hormone was high on love guilt. Of the five subjects who were high on good General Diet and also on Conscientious Effort four belonged to the love-guilt group, one to the stern superego group.

Individual Patterns.—It will help to clarify these pictures if we consider two individual children, in one of whom the one pattern is predominant and in the other of whom the other pattern is clearly manifested.

The stern superego pattern is well exemplified by Jean, who at eleven years is a tall, heavy, well-muscled girl, advanced skeletally nearly a year above the average. On both male and female sex hormones she is high for her age, and she belongs to the group of girls who show relatively more male than female sex hormones. Jean blushes easily, sweats freely, and shows a marked variability of pulse rate. She is, to sum up the physical picture, a girl who is generally advanced physiologically and has a highly reactive autonomic nervous system. In her manifest behavior Jean is noted for her conscientiousness and responsibility. She is orderly, methodical, persistent, sometimes to the point of being perfectionistic and overscrupulous. These traits stand her in good stead in her schoolwork, particularly in subjects where precision and thoroughness count. A clear and logical thinker who stands in our highest group on excellence of school grades, she is prevented from being even better by her too great deliberation, she is slow in getting started, and the quantity of her work suffers. If Jean is strict with herself, she is also strict with others, not hesitating to condemn them for their moral shortcomings. Quick to perceive misbehavior in others, she also has been observed with some frequency to imagine that others were blaming her when in reality this was not the case. This concern with standards of conduct, with what is right and what is wrong, seems largely to dominate the picture of Jean's personality. There is little social feeling, little concern with sensory pleasure, little creativeness, little humor. In Jean's phantasies the theme of crime and punishment predominates. Robbers, murderers, and ne'er-do-wells are constantly at odds with authorities who, their patience exhausted, as it were, are particularly ruthless. Noteworthy also is concern with sensuality and excitement—something that is almost totally lacking in Jean's manifest behavior. Of especial interest also is a theme of abortive romance. A young man and a young woman who have an erotic interest in one another are common characters, but they never succeed in "getting together." No romance has a happy ending. Remarkable indeed was one long story in which a young man and a young woman were time and again brought to a place where the phrase "and then they were married" would have ended the story, but instead "fate" or some highly accidental or unrealistic circumstance intervened until finally, when it seemed that Jean had exhausted every means by which these people might be kept apart and the story had to end somehow, the young woman committed suicide.

To order all these facts the formulation of strong instinctual drives coming into conflict with strong inhibiting forces seems well adapted. One source of the strong drives, it seems, may be found in Jean's physiology: she is higher on sex hormones than most children her age and is entering the period of "adolescent stress." At the same time, jealousy of her younger brother and resentment of her mother's domination seem to have generated strong aggressive feelings. But if Jean's instinctual urges are strong, it is also true that she has, and has had, less opportunity than most of our children to express them in action. Her mother has always kept tight control over Jean's actions and has insisted upon the strictest adherence to standards of regularity, order, and self-control. This strictness Jean seems to have accepted and made her own. She can now be harder on herself than her mother was. This state of affairs is a source of great strength in Jean. She is a girl of principle and purpose, capable of achieving much and enduring much. But what is her strength is also her weakness, for unless she can become reconciled to some of her underlying wishes, or find some way of expressing them which is compatible with her own standards and those of her environment, she will have to direct a great deal of her energy to holding them in check.

The love-guilt pattern is well exemplified by Lora, a girl of ten years. Save for the fact that she and Jean are both high on Conscientious Effort, there are few points of similarity between them. Lora is average in stature and physique and extreme on none of the physiological patterns we are considering. She is very active and exceedingly well coordinated. She is in the high group on excellence of school grades and is especially apt in those subjects—art, writing—in which expressiveness is an important factor. In the General Concepts Experiment, her approach is subjective and participating. She has a quick lively enthusiasm which sometimes causes her to rush ahead so fast that the quality of her work suffers, but in spite of this she achieves high standards of workmanship and thoroughness. It seems that her natural tendencies are toward creativity and rapid productivity, but if form is required she is willing and able to achieve this, too. A noteworthy feature of her work is a tendency toward unevenness. Remarkably "good" periods are interspersed with periods of haste or carelessness. This variation seems to depend most largely upon how Lora is getting along with the people around her, upon whether she likes her teacher or thinks her teacher likes her or sees an opportunity to please her teacher. Lora is essentially a social being, friendly, affectionate, responsive. Asked to choose one from a number of "wishes" on a questionnaire she selected "to be loved by other people." She wants to be a good girl, and being good, to her, means having the love and approval of those about her. In her phantasies, Lora's main concern is with love: with the guilt and remorse that follows failure to please a loved person, with the "good feeling" that comes when love is won by virtuous behavior. The following brief story is typical and seems to suggest Lora's dominant attitude.

Picture of a woman with child in her arms: "Looks to me as though she had a baby and she liked it very much; looks to me as though she's kissing it. (What will happen?) Looks to me as though it might grow up to be a nice child. (And then what?) I suppose he'll be obedient. (Yes.) Well, he'd do lots of good things in his life. (What will he do?) Well, he'd help the poor."

Lora has been, and is, a much-loved child. She is her father's favorite, and though he is a shy and reticent man she has been able to elicit from him a great deal of demonstrativeness. A middle child from a stable home in which there is a normal amount of discipline, Lora has developed an adequate capacity for disciplined effort. She functions well, however, only when she is supported by the love and good wishes of other people. In this respect, she differs from Jean who, for better or for worse, is able to carry on more or less independently of what other people think. Jean has the inner firmness to carry her through an emergency, but this has developed somewhat at the expense of her ability to participate in the ordinary satisfactions of life. Lora is able to attain much satisfaction through her social relations with others and to meet ordinary responsibilities, but for the strength to meet emergency she must depend upon someone else.

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CHAPTER XXXIII

DEVELOPMENT IN ADOLESCENCE: A CASE REPORT*

Harold E. Jones

The Study of Individual Development

The principal method of studying human growth and development is through the comparison of data collected at different maturity levels. Within this method, several variations are possible. The data to be compared may refer to the same individuals observed through time, or to different individuals sampled from groups of differing maturity. The data may refer to a single aspect of development, such as mental or motor ability, or to several aspects considered jointly. Each of these types of research material has its special value, and each has been used to supplement others in connection with various problems of development.

The present report consists of a series of studies of records obtained for a single individual over a period of 7 years. The individual in question, whom we have called John Sanders, was selected from a grade group of 80 boys, in a study consisting originally of approximately 200 boys and girls.† It is perhaps difficult to say why "John Sanders" was chosen for this presentation, rather than any other of his classmates; others would have served the general purpose equally well, although some special interest attaches to this case because he presents, in somewhat sharpened form, a number of problems which are of common occurrence in our contemporary urban culture. In the case of John, these problems of adjustment are less remarkable for severity than for variety. John has been handicapped by unhappy relationships within his family; economic stress; ill-health; visual defects; an inferior physique; delayed maturity; a certain obtuseness in social contacts; lack of athletic abilities; and lack of ability to win goals which he has most desired in connection with a strong drive for popularity and social esteem. His school career, under the heavy accumulation of handicaps, has been notable for a cycle of personal difficulties followed by some degree of success and effective adjustment. Viewing this record, from the sixth grade to college, one cannot help being impressed by the amount of idiosyncrasy which can be encompassed within a "normal" range; and by the complexity of the problems which can be faced and even to some extent surmounted within a social structure which has done little to provide support or understanding. In the present condensation it has not been possible to include sections from the original work, dealing with physiological development, interests and attitudes, motivational patterns, family relationships, interviews with John and his parents, and records of creative expression. Moreover, no attempt has been made to give a closely integrated or "organismic" picture. The purpose of the present report is to describe a number of aspects of development in such a way that the reader interested in a specific approach can observe the application of this method and study an example of individual development as portrayed by it. While some interrelationships have been pointed out, these have not been emphasized for they are necessarily more conjectural than the well-established findings within each panel.

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* Assisted by the staff of the Adolescent Growth Study, Institute of Child Welfare, University of California. Condensed from Development in adolescence. I: Approaches to the study of the individual, by Judith Chaffey, Else Frenkel-Brunswik, Mary Cover Jones, Harold E. Jones, Wilma Lloyd, Frances Burks Newman, Nathan W. Shock; Harold E. Jones, editor. Unpublished manuscript. Acknowledgments are due to Dr. H. S. Conrad for reading the manuscript and to the Works Progress Administration Official Projects 65-1-08-62, A8, and A26 for clerical assistance.

† A description of the study in terms of sampling and special procedures may be found in Jones (2).

Until recently, our chief evidence about the adolescent period has been derived from studies which emphasize group results (*e.g.*, averages, age norms, mass correlations). This is understandable, since the testing of methods and of general hypotheses requires reliable evidence from many cases; competent investigators are not usually satisfied to work for long within the limited domain of a single case, which is properly regarded as a source of questions rather than of general conclusions. Nevertheless, as a teaching vehicle—to illustrate method and to present specific growth phenomena concretely rather than abstractly—a detailed study of individual development can be assumed to have certain merits. It is perhaps unnecessary to caution the reader as to the scientific limitations of this type of material.

John Sanders

John Sanders was eleven and a half years of age when he made his first visit to the Institute. He was described at this time as

> . . . a rather slim boy with tousled dark hair, a good-natured expression. The other boys appeared to like him well enough; however, he was the odd man, without a partner. He was inexpert and a little awkward in games with balls, horseshoes, etc.—like an adult who has not played for a long time. He did not seem to mind this—was a little apologetic and a little amused. As a matter of fact, he was quite at home in the Institute—drawing seemed to be one of his special abilities so he enjoyed himself. He never tried to dominate and yet did not submit to bossiness—resisting in a firm good-natured sort of way . . . .

John at this time was in the low sixth grade of De Soto Elementary School. Here he was in an atmosphere dominated by women. The principal was a little gray-haired person past middle age—orderly, kindly, conscientious to the point of fussiness, unpretentious, "old-maidish," devoted. Like the principal, all the teachers were women, kindly rather than friendly, conscientious rather than stimulating. Those under middle age were a little more spirited, but the whole tone was one of quiet, restraint, precision.

It was these women who knew the details of John's home background and were sorry for him. That his mother dominated the household; that his father was a plumber out of work; that he was a "socially only child" (one sister eight years older was married and living in the East); that John himself was overburdened with cooking and cleaning and errands; that his health had been delicate: all these things each teacher knew and in turn passed on to the next when John was promoted. The teachers must have observed, also, that John was often ill at ease with his classmates, awkward in games, and alone. But the final report about John, sent on by his sixth-grade teacher, did not mention his lack of physical skill or social ease. Presumably in this early setting these were not looked upon as formidable handicaps. Our observer's first notes about John stress the point that in his own small group, although he was clumsy at games, he did not seem to feel disturbed about it.

John's Home and Neighborhood*

As far back as he could remember, John had lived in a shabby-genteel house in the middle of an "average" block in West Town. It was a slightly battered but very respectable neighborhood. Little could be said for the beauty of architecture of the small homes so compactly built on uniform lots in this area; each house, however, had its hard-won "utilities" (electricity, gas, city water); each had its cluttered back-yard; each had some attempt at a front lawn, with an occasional brave clump of shrubbery.

Four thousand dollars would have bought outright the average home in West Town, and $26 per month would have sufficed for an average rental during the depression decade of the thirties. These figures for West Town as a whole applied also to John's neighborhood, where two families out of five owned their own homes.

The vigorous commercial enterprises of this large, growing city were not visible in John's small living area and were glimpsed only on those infrequent excursions when he walked with his father toward the industrial district or ventured by ferryboat to the still larger metropolis across the bay. Toward the east, on wide reaches of hills, were the homes of the more prosperous residents of West Town, spaced with green lawns, sheltered with trees, and built to command a view of the teeming city and the harbor below.

As long as John lived within this environment, he might well have said, "Nothing ever happens here." Even the thrill and excitement of fire engines and sirens were infrequent around John's home. His little community was encircled by quiet mediocrity. It was in the reduced tempo of this neighborhood, and in a quiet, suppressed family life, that John received his first impressions of the social structure within which he was expected to fit his own conduct.

Junior High School

When he was twelve and a half, John was graduated from his accustomed elementary school surroundings into the seventh grade at Jackson Junior High School. Now he traveled a little farther afield on his way to school. No longer a member of a small group of 200 children, all from a somewhat similar socioeconomic background, he now studied and played in a much larger and more diverse population. He met in his classes boys and girls who came from less substantial, less financially secure sections than his own; and he also, for the first time, came in contact with the children from well-to-do homes in the hill districts.

Senior High School

Tugwell Senior High into which John was graduated at the age of fifteen and a half had some elements of similarity to but also many of divergence from his junior high school. His home was still within walking distance of school, though he now walked toward the bay through a poorer section of town rather than toward the hills and better homes. He went on to high school with the majority of his earlier classmates but into a school population twice the size of the former. About 100 students from Jackson Junior High School were scattered among an incoming low-tenth grade of over 300. Because of the greater diversity of courses (only one course was required) John saw no more than one or two of his earlier acquaintances in each class.

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* This and the following two sections were prepared by Dr. Mary Cover Jones.

Owing to the fact that this school was situated in a relatively poor neighborhood, John encountered more representatives of other races and more children of foreign-born parents. There was also an increase in the size of the group of high economic and cultural level since this was a "progressive" demonstration school which, because of its university connections, had acquired the highest social prestige of any high school in the city.

John as Seen by His Teachers

The record of John's earlier schoolwork is limited to a simple ledger of attendance and grades. If his elementary-school teachers had any special knowledge of John, any understanding that would have been helpful to those who were to teach him and counsel with him later, we have no evidence of it in the "cumulative folder" that accompanied John to his junior high school. Perhaps one reason for the silence about John is that he was "well adjusted" in the sense of not making any trouble for his teachers. Quiet and well behaved, his marks during elementary-school were consistently "Good" both in scholarship and in conduct.

At Jackson Junior High School he continued to receive an average grade of *B*. Exceptions were the *A*'s that he gained in art and in creative writing, and the *D*'s and *F*'s that marked his record in two years of French.

John's greatest scholastic handicap* was in the learning of foreign languages, a difficulty that reappeared in senior high school, when an *F* rewarded his baffled efforts in German and a bare passing grade was all that he could make in Spanish. His difficulty in learning the spelling and meaning of words seemed greater than would be expected from a boy of his general intelligence. A similar difficulty was apparent in English classes whenever spelling or accuracy of form was demanded.

On the whole, John's scholarship in grades 10, 11, and 12 maintained the passable but irregular level of the preceding grades. Offsetting an occasional *A* in art and in social studies, he dropped to *D*'s in mathematics and English grammar, the latter course being one which he disliked almost as much as a foreign language. By his last semester in high school John had definitely decided to go to college; spurred by the imminent need of college credits, he managed to raise his general average somewhat.

To what should we attribute John's uneven record in school? Certainly not to a general weakness of intellectual interests, for as we shall see in a later section he was exceptional in the breadth and vigor and resilience of these interests in a period when they carried very little prestige (compared with social and athletic skills) among the majority of his classmates. John would have liked to do better in school, but there was always a touch of the dilettante about his work, a tendency for interests to flag whenever he was required to do things that were precise and detailed.

Prominent in the reports of junior-high-school teachers were indications that:

1. John had "creative imagination" and special ability in art.
2. His study habits were fair.
3. He resented direction in the home room.
4. Under disabilities the following comment was made, "Adenoids affect speech. Although he aspires to be a singer (yes, a singer!) he is completely lacking in everything that makes him acceptable before any group. Needs help badly."
5. Referring to personality make-up: "An individualist—but pleasant. Very serious—sensitive to beauty. Rather mature philosophy—not at all sophisticated—rather like an old man."

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* Material in this section was assembled by Judith Chaffey.

In such comments we find suggestions of his creative flair, his resentment of direction, the discrepancy between his aspirations and reality, his seriousness, his individualism.

At the end of the ninth grade a counselor wrote:

> John was not at all popular. It was difficult to tell whether or not he was unhappy. He was matter-of-fact, business-like and impersonal in his manner and had an insatiable intellectual curiosity. He did not seem actively unhappy except in competition with other boys in physical education. John's persistence and creative ability and impersonal matter-of-fact attitude will probably save the day for him in spite of his queerness and lack of popularity.

His other teachers also caught occasional glimpses of John's personal difficulties and of his problems in social adjustment, but they had little opportunity to understand these problems or to plan any effective ways of dealing with them.

In senior high school the teachers' reports became more frequent and more explicit. Perhaps the chief impression that one gets from the comments at this period is that John was a complex character, difficult to assess, and presenting a very different picture to different teachers. The comments vary from warm endorsements ("He has a wholesome, integrated personality,") to the laconic diagnosis, "Needs social adjustment." There is agreement about his seriousness, but while this impresses some teachers as a very commendable trait ("I was especially interested in the way he continued to think about things that others would have passed over with a comment and forgotten"), others regard it as a handicap ("He asks more questions than anyone—part of his seriousness; he isn't satisfied with less than the whole answer. His type of seriousness doesn't 'fit' exactly"). The English teacher refers a little heatedly to his tendency to "argue about things that aren't arguable." Repeatedly the suggestion emerges that he was inept in making initial adjustments to a class but tended to improve in the course of the semester. During periods when he was not getting along well, he would tend to be resistant, defensive; as one teacher put it, he was "determined to be stupid." There was disagreement as to John's actual ability. Intelligence tests placed him slightly above the average of the high-school group.*

In achievement tests, he was about average in reading (handicapped somewhat by a slow reading speed); below average in arithmetic; markedly above average in tests of language and of social studies. In interpreting his schoolwork, some of his teachers felt that John's intellectual interests tended to outrange his ability; "His comprehension is nothing above average; he is slow in everything he does . . . slow in understanding." "He works beyond his capacity, if anything." "In creative writing John's ability and intellectual equipment did not come up to his interest; he has some talent, but is very limited in creative power." On the other hand, the view was sometimes expressed that John was scattered in his efforts, too easily distracted by side issues, inconsistent in application, and hence that his grades were not a good indication of what he could have done if he had really applied himself. It is not unexpected that this division of opinion led to conflicting recommendations as to John's suitability for college. "A poor risk as a college student," "Utterly unable to succeed in college," "I know the quality of his mind; I have no fear of his success in college," were among the opinions expressed.

It is not common for high-school teachers to describe their pupils in terms of developmental changes. Their views about individuals have a life cycle limited to the semester. One teacher, however, had observed John throughout his career at Tugwell High and felt that he could comment on John's improvement in social relationships.

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* In five administrations of the Terman Group Test over a 5-year period, John's average I.Q. was 112.

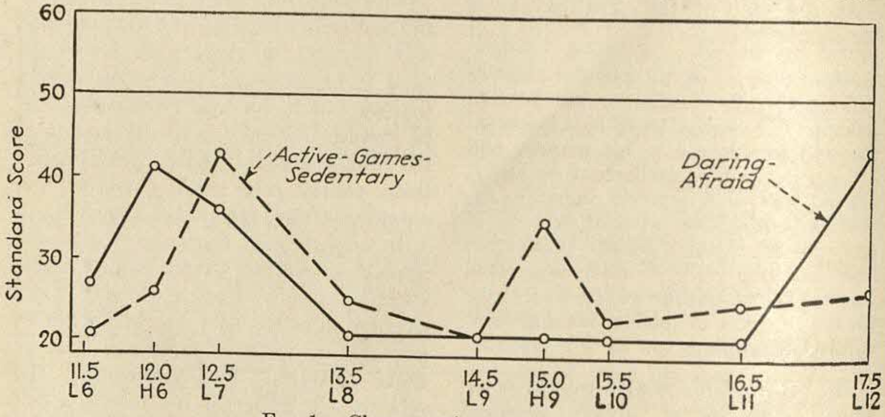

FIG. 1.—Classmates' ratings of John.

> Two years ago he was having difficulties socially and conflicts intellectually and emotionally . . . . At that time he was "alone" in a mixed group whose interests were quite different from his. When John gave oral reports, the class did not pay much attention . . . he was much more "uncouth" than he is at present . . . . But John is no longer timid . . . he has made great progress in the ability to organize . . . commands respect from his peers. He is objective, critical in sizing things up . . . penetrating in his judgments of people . . . well-balanced and well-adjusted.

John as Seen by His Classmates

Did John's classmates have a more consistent picture of him than his teachers seemed able to achieve? Our knowledge of his reputation among his peers is based on results from a test described in greater detail in another chapter of this volume (*cf.* Chap. XXXI). Administered annually and for certain years semi-annually from the sixth through the twelfth grade, a ballot record on a series of reputation traits tells us what John's fellow pupils thought of him, as compared with others of the same grade level. For each trait, scores were computed indicating the percentage of times a given individual was mentioned as having that particular characteristic. These measures were transformed into standard scores ranging from 20 to 80, with 50 representing an "indifferent" point or point of zero mention. Figure 1 presents standard scores for John in two variables, Daring-Afraid, and Active-Sedentary. In this as in the succeeding figures, scores below 50 represent an unfavorable status, scores above 50 a favorable status from the standpoint of adolescent prestige. We note that, with scores below 50, John is generally considered to be inactive in games, *i.e.*, he receives numerous votes as resembling the description, "Seldom plays active games like football and basketball, prefers to read or to sit and play quiet games." He is generally considered to be afraid rather than daring ("Is always worried or scared, won't take a chance when something unexpected or unusual happens"). In the latter reputation trait his score was consistently at the very lowest extreme of the group on each testing from the low-eighth to the low-eleventh grade, although some improvement was shown in the low-twelfth. In view of the high prestige, at this age, of physical activity and athletic skills, we might expect that John's status with the group would not be high in terms of popularity. Figure 2 indicates that except for the sixth and seventh grades he was distinctly on the unpopular side of the average, reaching a lowest extreme in the low eleventh, and we may also note that he was generally regarded as unfriendly ("Doesn't care to make friends, or is bashful about being friendly").

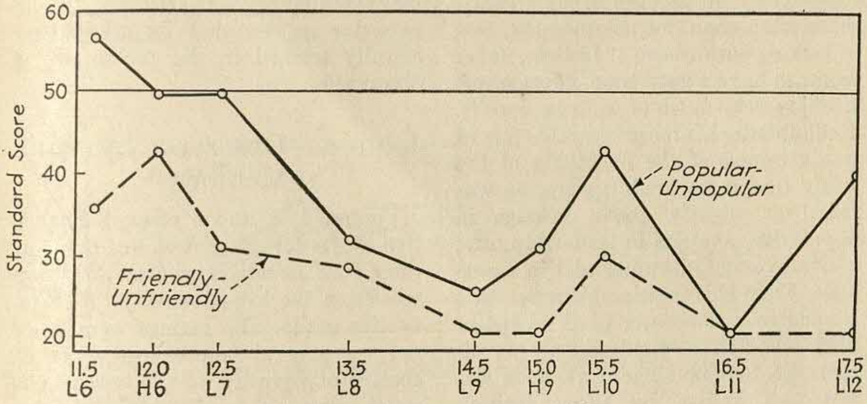

Fig. 2.—Classmates' ratings of John.

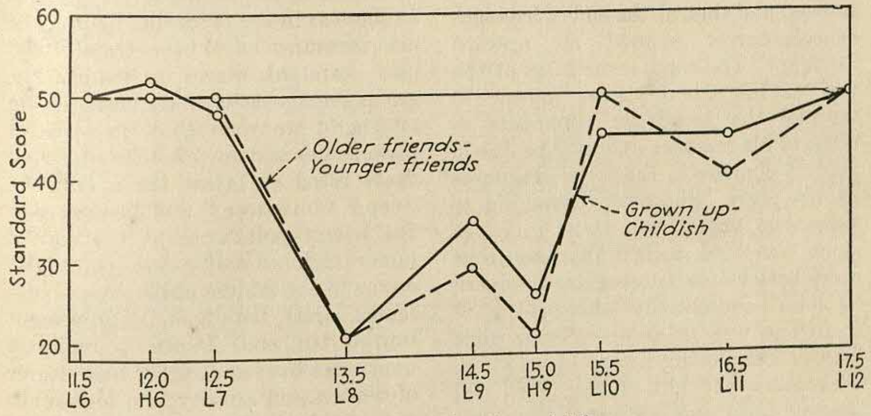

Fig. 3.—Classmates' ratings of John.

Figure 3 illustrates the impression John made with regard to maturity; while at other ages he was rarely mentioned as being immature in behavior or in his choice of friends, it is worth noting that during the eighth and ninth grades, between the ages of thirteen and a half and fifteen, John was quite conspicuously on the less mature side of the scale. We shall see, later, the relationship of this to our data about John's physical development. It is also important to note the general opinion that John was more feminine than masculine in his interests. A reputation as a "sissy," coupled with a social stereotype of avoiding fights, being submissive, afraid, and inexpert in games, is no light handicap for a boy who had strong social drives and a desire to be socially accepted.

In his other reputation traits there is little evidence of any characteristics which would seem to place him in a more favorable light in the eyes of his associates. He was regarded, quite consistently, as lacking in good looks; more often than not, as unhappy, and as lacking enthusiasm ("Listless, never seems to have a good time, never seems to enjoy very much of what he does"). Undoubtedly his most favorable record was attained at the beginning of the study (low-sixth grade), when he was noted as slightly above average in popularity, average in leadership, and above average in humor and in assurance. From this position his reputation slipped to a low-water mark in junior high school; recovered slightly at his entrance to senior high (when he was less well known by those voting); declined again as he became better known; and then at the end of his high-school career showed an upward tendency. The reputation gains at the end of his school career appear to parallel the trends in comments of some of his teachers and may be due in part to changes in the social standards of his peers, who were beginning to place less value upon traits in which John was weak and at the same time were better able to recognize the merit of John's endeavor in other fields.

In one way or another, John could hardly help being aware of what his classmates thought of him. With the brutal frankness of youth his contemporaries had on various occasions addressed him as "Worm," "Jackass John," and, in derision of his physical incompetence, "Old Ironman Sanders."

We may think of John's reputation as influencing to some extent his actual traits of behavior, even though in order to "take" the jibes of his classmates he must have had to soften their impact by various interpretive compromises. The relation between reputation traits and actual behavior is of course subject to various halo effects and other modifying factors. It is instructive, however, to consider the extent to which John's reputation, as viewed by his classmates, was similar to his behavior as recorded by adults specifically trained in the techniques of observation.

John as Observed by Staff Members*

Figures 4, 5, and 6 present illustrative charts for characteristics rated by three staff members at 6-month intervals from the low-seventh to the low-twelfth grade. The ratings were based not on general impressions, but on specific observation of the behavior of small groups of boys during free-play situations at the Institute playground. In these as in the preceding figures, the raw measures have been transformed into standard scores in which the group average is 50. In the traits shown in Fig. 4 we note that, in spite of periodic ups and downs, John was at all times rated as below the average in "pep," "initiative," and "eagerness." His lowest point was at the end of junior high school; a low point also occurs in the middle of his senior-high-school career, with some improvement toward the end. Figure 5 indicates tendencies toward a rather high degree of tension and anxiety; the high-ninth and low-eleventh grades are again unfavorable periods, with recovery toward a more normal position just before graduation. Figure 6 illustrates, for popularity, a generally poor level, with low points corresponding to those in the preceding figures and also corresponding to Fig. 2, which presented data for popularity as noted by classmates. Not to labor the point, details will be omitted for other traits, in which the observers agreed in rating

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* A description of the situations in which observations were made, and of observational techniques, is given in Jones (3).

John (with minor fluctuations) as low in attractiveness of appearance and expression, in masculinity of physique and behavior, in sociability and enjoyment of social situations, in cheerfulness and good-naturedness, in smiling and animation, in confidence in games, and in leadership, initiative, and social-stimulus value. In most of these characteristics his ratings show improvement in the last year of school.

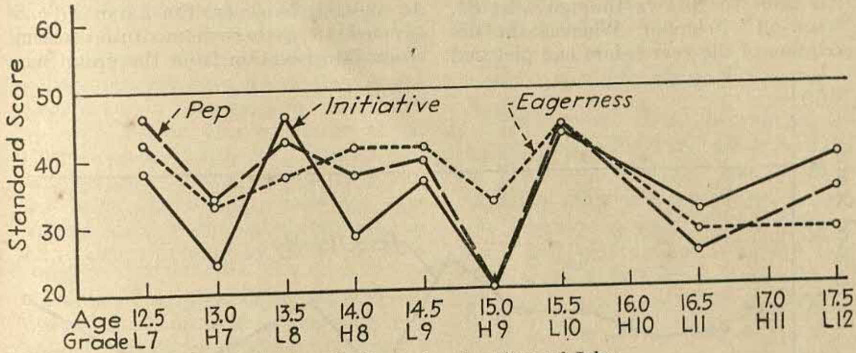

FIG. 4.—Staff members' ratings of John.

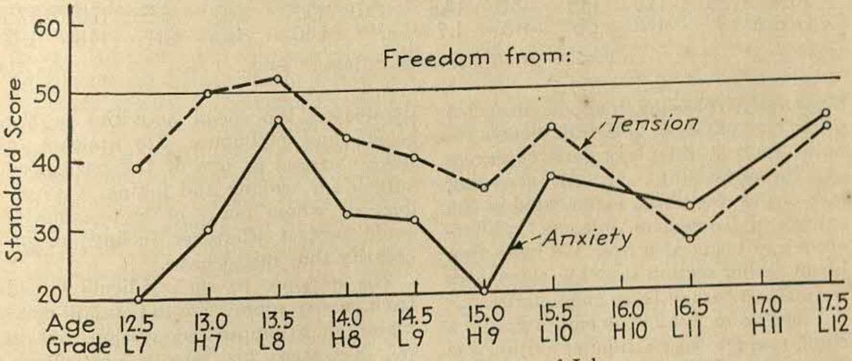

FIG. 5.—Staff members' ratings of John.

Similar evidence is available for another series of observations, extending from the eighth to the twelfth grade, and based on behavior in a wide range of social situations at a clubhouse maintained by the staff, at school dances, and on excursions in which staff members participated. In situations involving both boys and girls, a similar picture was obtained for both opposite-sex and same-sex relationships. John was rated as low in self-assertion, in assurance, and in expressiveness. He was less unpopular with girls (who seemed more tolerant of John's idiosyncrasies) but with them also his status, in terms of popularity, still remained for the most part below the average of the group as a whole.

The description of behavior in terms of ratings is necessarily limited to specific categories and standardized terms. It is frequently useful to implement such a description with a running narrative and with summaries based on both ratings and comments, as in the following excerpts from a discussion of John's behavior by one of the observers.*

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* This material was prepared by Frances Burks Newman.

The foreshadowings of social inadequacies, as shown in the sixth-grade records, are followed by increasingly strong indications during the next year, when John was rated as rejected by the group, submissive, unsocial, unexpressive, lacking in self-confidence. At the same time, he appears to have sought attention from the others through affected, "show-off" behavior. Whereas the description of the year before had pictured him as fairly pleasing in appearance, this year his physical unattractiveness is noted by both the playground observers and the physicians . . . . An increasing lack of purposefulness is indicated in the ratings of listlessness, idleness, indifference, and being at a loss. We have seen in an earlier section that his classmates were also aware of these characteristics.

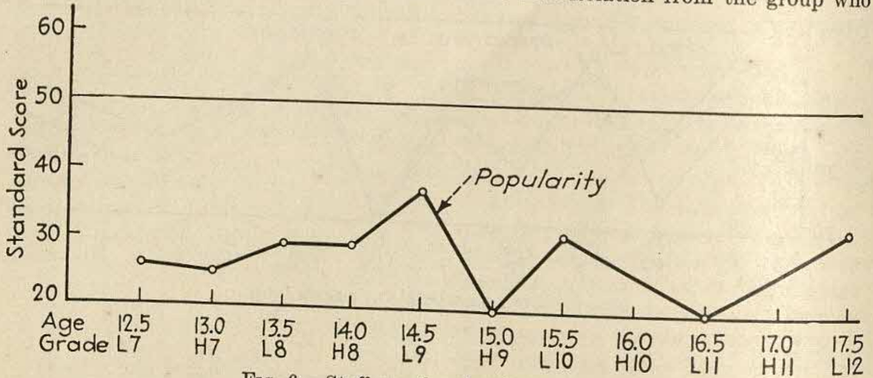

FIG. 6.—Staff members' ratings of John.

When John was in the eighth grade, a clubhouse for leisure time activities was opened in a building next to the junior high school. Into the spacious rooms and yard of this two-story dwelling, students thronged during their free school periods; the house was also in constant demand for evening parties. John did not wait long to take advantage of the clubhouse facilities. He made his first appearance two days after the opening and thus launched on a career of faithful participation in the clubhouse social projects, extending even beyond his high-school graduation . . . . During this year John again appears ineffectual among most of his contemporaries and increasingly disliked and ridiculed by many of them. He showed an intense desire to participate in group activities, even in the face of frequent frustrations, and managed to gain some social recognition, chiefly from a small group who appreciated his artistic talents. During a brief fad of playing backgammon, John achieved the position of instructor among a group of boys with high prestige. After this transient recognition had come to an end, however, the harsh ridicule seemed to gather momentum, forcing John into isolation from the group who dominated the social activities of the school and clubhouse. He appears to have emerged as one of the recognized targets for scoffing and joking, a scapegoat on whom many of his classmates could project whatever feelings of insecurity they might have.

His response to such ridicule varied from passive submission to petulant complaint, or attempted aggression, but in no case were his retorts particularly effective in quieting those who tormented him, or in gaining their respect. He frequently seemed to be unaware of the kinds of behavior that would be acceptable to the group.

John's attempts to participate even in the face of cruel rebuffs and ridicule seem to attest to his strong social inclinations; his efforts to gain attention may have been indirect compensatory symptoms of the same drive. If this is a valid interpretation, we may conclude that the frustrations of the desire acted cumulatively, since his efforts became increasingly insistent. There is also the possibility that any kind of attention, even unfavorable, was more satisfactory to him than no attention at all.

With John's entrance into senior high school it was apparent that he had established neither the close companionships nor the casual group ties that characterized the social relationships of his classmates; he was forced to be grateful for occasional transient attentions. Comments on his behavior imply that he had withdrawn from earlier beginnings he had made in contacts with girls, but this was not unusual among the less socially mature boys when they found themselves in competition with five layers of older classes above them. Throughout the tenth year, John's social contacts were limited chiefly to a few boys who, like himself, were not conversant with or especially successful in the folkways favored by the group as a whole.

The last two years of John's development seem to provide an especially enlightening basis for prediction. The most outstanding general trend is John's dogged advance toward overcoming his difficulties, especially in the social sphere. His friendship with one other boy (Ralph Souza), his increasing ease among other classmates and freer conversation with adults, his emerging humor about himself, his efforts to observe certain social forms, his superior work in social studies and art classes: these shifting behavior manifestations all suggest a positive change toward feelings of personal adequacy. Through Ralph's understanding companionship, John seems to have gained an increased sense of security which later became reinforced through association with several teachers and other adults whom he admired and who followed his pursuits with particular interest.

The foregoing has included only a small fraction of the observational records about John. From these excerpts, and from the observational data as a whole, one may conclude that in John's last year of high school a favorable trend was occurring in many aspects of his social behavior. He was showing some growth in companionability, along with a greater expressiveness and fluency in social situations. The major conflicts present since his elementary-school days were by no means resolved, but as John set out to college there were many indications that he was learning to function acceptably in spite of these sources of disturbance.

John as He Saw Himself

John's views about himself in his relationship to the world about him can be examined through data from a variety of interview procedures, projective techniques, interest and attitude tests, and personal-social inventories. Since space is lacking to deal with all of these in detail, we shall confine ourselves to the source most adapted to the present purposes, the U. C. Inventory I.*

In each of the curves shown in Fig. 7 an improvement occurs from the sixth to the seventh grade, a slight decline from the eleventh to the twelfth. These trends run contrary to what we know of actual changes occurring in John's status in the group. In general, the inventory scores provide an accurate parallel of other indexes; thus, if we take the 7 years' average for each category, we find that John obtained (as might be expected) extremely low scores in Social Adjustment, Family Adjustment, and Personal Inferiority (35, 32, and 30, respectively). In School Adjustment he was above the average, in agreement with our other evidence about John's intellectual interests and his compliance with the school regime. It has been true of John, however (as with many other cases), that during periods of critical change a significant *inverse* relation is sometimes shown between scores based on self-report and other measures of behavior. This tendency can be examined in greater detail if we turn from standard scores to results from the analysis of John's responses to individual items.*

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* This personal-social inventory was given yearly for 7 years, beginning in the high-fifth or low-sixth grade. Together with several additional series of items, the inventory included a number of sections from a test reported by Rogers (4).

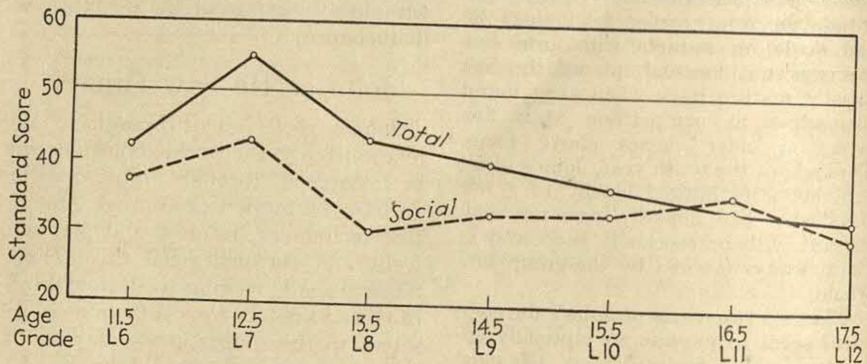

FIG. 7.—John's ratings of himself.

John's self-appraisal dropped to a low point in the eighth grade. He represented himself as lacking strength, "looks," skill in games, or ability to dance; as being poorly dressed and ranking low in popularity and leadership. This gloomy picture brightened somewhat in the ninth grade, when other evidence indicates that his actual status was deteriorating rather than improving. In the tenth grade the ratings of his own ability and academic standing were lower than at any other time, and he expressed a wish "to be brighter." In the eleventh grade he was extremely low in self-ratings of social traits, improving somewhat during the last year of high school.

In each year a large discrepancy occurs between the degree of popularity attained by John and the popularity he wished to attain. However, from the sixth grade through high school there seemed to be an inverse relationship between this boy's admissions of deficiency in personal qualifications, or in status with peers, and his willingness to admit unhappiness or recourse to an imaginary world. When by his own estimate his status was best, then by his own admission his feelings were gloomiest and he preferred make-believe to reality.

An exception to this tendency occurred in the twelfth grade. At this time John's reported feelings corresponded appropriately to other conditions as reported at the same time, thus making it appear that he had less need to protect himself. His self-evaluation was not extremely low, although there remained a good deal of dissatisfaction with personal qualifications and with his relationship to peers. He wished that the boys and girls would like him better and was somewhat unhappy because they did not. He acknowledged a tendency to enjoy an imaginary world more than the real one but did not wish to change in this. Apparently he still found satisfaction in phantasy but did not seem to find it necessary to protect himself either by self-inflation or by denial of feeling. A possible explanation of this change is that with improved status in the group he felt it less painful to admit both his unhappiness and his isolation.

Of special interest is a study of John's aspirations. This can be done by examining responses on items of the following type:

D. is the best ballplayer in school.
1. Am I just like him?
2. Do I wish to be like him?

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* This is a condensation of an analysis made by Judith Chaffey.

John's answers to the second question on ten such items indicated a wish to be "just like" at least nine of these imaginary individuals who were so outstanding. During the semester in which he entered senior high school, a slight modification appeared in his aspirations. He then wished to be "almost like" those individuals. His aspirations included wanting to get very good marks, to be the brightest boy in school, to be strong enough to beat any of the other boys in a fight, to be the best ballplayer and the most popular boy in school, to be a leader, to have more spending money, to dance better, to be better dressed and have more girl friends than any other boy.

His responses were unusual not only because his aspirations, in a single year, were so undifferentiated, but also because they showed so little change from year to year. It was typical for boys to select areas in which they wished to be outstanding, the areas differing as they matured and as their values changed. During the first 3 years of the study, boys commonly wished to excel in physical prowess. At that time they indicated little or no desire to have many girl friends, to excel in dancing, or to be well dressed. In the next 2 years they became interested in being superior in these respects and in addition wished to be popular and to be leaders. By the time they had reached the second year in senior high school there are indications of a general decrease in the value attached to physical prowess, popularity, leadership, and appearance; the tendency of the group was to wish to be above average but not to be outstanding in these respects. The only aspirations John shared consistently with the group were to be bright and to get good marks. As a group the boys did not relinquish these aspirations, although for the most part they were more moderate than John in expressed desires.

An item relevant to aspiration level was one in which a response was requested to the following question, "Suppose that just by wishing you could change yourself into any sort of a person, which of these people would you wish to be?" Persons representing 26 vocations were listed, with a space for additions should these be desired. Although the directions called for indulgence in phantasy, most of the boys were more realistic in their responses as they grew older, their phantasy wishes becoming more in accord with attainable goals. John, however, was as phantastic in his first choice in the twelfth grade as in the sixth. Both times he reported that he wished to be a monarch. This choice was rarely checked. John was the only boy who at any time indicated a wish to be a singer. Five times he expressed a wish to be a movie star. While this was not so unusual a choice as monarch or singer, considering John's potentialities it represented a distinctly unattainable goal. John's wish to be a cartoonist was the only choice in accord with his talents and professed vocational goal. This was frequently his second or third but never his first choice. The wish to be a detective was common among the boys for the first 5 years. That John continued to indicate such a desire after that period was consistent with his tendency to indulge in wishes for the unattainable. This characteristic was also revealed in his voluntary comment on the last Inventory, "I dream quite often about things I want."

A survey of the Inventory responses alone, without substantiation from other data, would suggest the following summary of John's relationship to his peers and his feelings about this relationship. We have noted evidences in John of dissatisfaction with his family relationships, indecision, lack of self-confidence, a feeling of weakness in face of high aspirations, sensitivity to criticism, and an over-concern with various aspects of social recognition. Such a combination of factors may well have operated to hinder the possibility of satisfactory companionship with others. Unhappiness over his social isolation was apparently accompanied by attempts to remedy the situation. Lack of success in these attempts led in turn to the use of denial, phantasy, and self-inflation to protect himself from the pain of failure. In John's last year in high school certain parts of the self-report Inventory as well as other sources of evidence point to an improvement in personal-social relationships. From all these sources, however, we also obtain suggestions of continued unsolved problems in adjustment.

John's Physical Development

As a child John was not an asset to the health records of West Town. He was a scrawny infant, weak in appetite, slow to gain. Perhaps this was not unrelated to his mother's illness, which kept her in bed for some months after he was born.

In later childhood John remained finicky about his food, with many fussy specialties in what he would or would not eat. The usual childhood illnesses are noted in the school medical record, including a severe case of measles; bronchitis, otitis, and repeated minor upsets—indigestion, constipation, colds. During the whole of elementary school he was present, on the average, only 3 days out of 5. This record of "delicate" health persisted into adolescence, with minor digestive upsets and marked susceptibility to colds, although he had now had fewer absences from school.

From the age of eleven and a half years, John received a physical examination at the Institute at approximately 6-month intervals until the age of eighteen and a half. In the first examination, the physicians noted little in the way of physical handicaps, with the exception of a muscular development slightly below normal. At twelve and a half years, however, they recorded him as physiologically immature, his dental development definitely below average; no increase in testicular growth had been noted as yet. He showed a tendency toward a feminine distribution of fat, retarded pubic-hair development, and markedly small genitals. Although possessing considerable subcutaneous fat, he was small-boned and his total weight was slightly below the group mean. Subsequent records include such notations as, "Boy does not seem well," "A generally below par condition," "Not well nourished," "Still having frequent colds."

These physical limitations were not only a scholastic handicap but even more markedly they served in John as a barrier to the development of adequate social relationships. The retardation in sexual development, so obvious to the physicians, was by other signs also apparent to his classmates, who at this age were beginning to accord a special measure of prestige to indications of masculinity and of growing up.

At the time of the first anthropometric measurements (age 11.4 years) John weighed approximately 80 lb. and stood slightly over 4 ft. 9 in. in height. Seen on the playground among his classmates he appeared approximately average in physical size and conformation. But in the following years John grew more slowly than his classmates. He lagged behind in height, in weight, in nearly every measure of physical size. With the tediously slow increments characteristic of delayed maturing (85 per cent of the boys in his group were earlier in maturity than John) he dropped to the twenty-fifth percentile in height, the fifteenth percentile in weight, below the tenth percentile in shoulder breadth. This was in the high-ninth grade, age fifteen, his lowest point in physical status relative to the group, and also (if the reader will recall) an exceptionally bad period in nearly every measure of social relationships as observed by his classmates and by adults.

Immediately following the age of fifteen, John experienced a belated spurt in growth, growing in height more than twice as much as in the preceding 6 months. By the age of seventeen and a half (twelfth grade) he recovered his former relative status in height, but most of the other measurements still showed a deficit as compared with the average and with his earlier position in the group. At this age we have the impression of a boy who is normal in height; of slender build and light in weight; narrow-shouldered and with a narrow chest cavity; and notably below average in muscular development, as indicated by arm and leg circumferences. These deficiencies were not compensated by any obviously attractive characteristics of physical structure or function.

Nevertheless, John was no longer a "little boy" among classmates who could look down upon him as childish and immature, and undoubtedly this restoration toward an approximately normal physical status was one of the factors accounting for improved adjustment in the last year of high school.

Other factors, however, were also in part responsible for this improvement. In our other measures of physical abilities, based on strength and on a series of athletic events, John was (in the ninth grade) one of the poorest in the group. His growth curve for strength of grip was closer to the level of the girls than of boys. Two years later, although still poorer than the average, he had moved up nearer the mean in every measure.

It cannot be doubted that John's deficiencies in physical ability, most evident in the ninth grade, reacted unfavorably upon his position in the group and upon his own adjustment. For the boys in this sample, the relationship has been studied between popularity and physical ability, strength, intelligence, achievement, home rating (socio-economic status), and height (1). At the eighth- and ninth-grade levels, the only individual factors correlating significantly with popularity were those based on physical ability and strength. Evidence was found that

> . . . among adolescents, the premium placed upon dexterity in games is high. It is correspondingly demonstrated that what adolescents of low physical ability lack in that trait must be made up in clear superiority in other traits . . . . such areas of compensation as friendliness or enthusiasm, cheerful attitude, humor, and assurance have been shown to serve.

John, however, was handicapped not only by his lack of athletic prowess and associated abilities, but also by personal traits which emphasized rather than compensated for his other deficiencies. We have noted in earlier sections that his ineptitude in activities enjoyed by other boys marked him as "queer"; it made for social isolation, and his response to this lowered status was to develop characteristics which further increased his unpopularity. John's delayed maturity was clearly one of the important elements in this web of relationships, but it must be thought of as accentuating rather than as solely producing the basic problems which he faced in social adjustment. Even with a normal timing of maturational processes, John would still have been relatively weak in traits prized by boys during the early teens.

The more favorable situation and prognosis for John, as he reached the end of senior high school, were due partly to changes in John as he laboriously caught up with the group; but we must give some credit also to changes in the group as they caught up with John, as their values and standards of achievement came closer to the sober aspirations which John had always held important.

In the study of single cases (as noted in the introduction) one should look for hypotheses rather than for conclusions. There is, however, at least one conclusion that can be lifted out of the developmental history presented here. It is, perhaps, a little like the conclusion to be drawn from a Horatio Alger story. John Sanders was a boy with an extraordinary accumulation of personal handicaps: physical, social, emotional, economic. He was unsupported by any special sense of security in his family; unaided by any special gift of intelligence or by any special insights on his part or on the part of his teachers. He reached a low point in adjustment, but he did not stay there. His subsequent record of successful work in college is evidence, perhaps, not only of the toughness of the human organism but also of the complex ways in which nature and culture can be brought into adaptation.

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CHAPTER XXXIV

CHILD TRAINING AND SOCIAL CLASS*

ALLISON DAVIS

The biochemical demands of the human organism find their expression only in a social system. No matter what behavioral manifestation of the child one examines, its form is always the result of the cultural environment, operating in specific ways upon the organism. No drive, no biochemical demand, no "need" escapes this process of social direction with regard to the form, time, and conditions under which it may be expressed. As a result, the social learning of the child refashions all drives into a complex of culturally determined "needs" or instigations. The study of human development, viewed as the integration of the organism as a whole, is thus concerned with biochemical processes as these are molded by the social institutions, the traditional rules of conduct, the cultural incentives, and the psychological goals of *that particular society in which the individual participates.*

In the effort to understand differences in human behavior and personality in America, one must remember that within our own society well-defined cultural groups exist. These characteristic learning and developmental environments of the child include ethnic, rural, urban, color-caste, and social-class cultures. Within each of these cultural settings, behavior also differs according to both sex and age groups. In our society, all these systems of grouping people are integrated and ranked into one hierarchy, that of social classes. In each of these class participation levels, a child learns different forms of behavior with regard to family relationships, sex, aggression, and work; he acquires different social goals, different "needs," and different codes of right and wrong, and experiences different psychological rewards and anxieties.

Social Classes

Criteria of Social Classes.—These participation levels, or social classes, with their distinctive cultures, have been described by research in both northern and southern communities. Social classes were empirically identified by W. Lloyd Warner (2) in Yankee City and by Davis and Gardner (1) in Old City as groups of people who are able to associate intimately together.

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* The research upon which this chapter is founded dealt with the personality development of Negro adolescents in New Orleans and in Natchez, Miss. It was sponsored by the American Youth Commission of the American Council on Education. It has been reported at length in Allison Davis and John Dollard, *Children of Bondage* (The American Council on Education, 1940). The present writer is indebted especially to Dr. Dollard, his colleague in this research; also to Dr. and Mrs. Burleigh Gardner, from whom he learned the white class patterns of child training in a joint research in a southern community, here called "Old City"; also to Prof. W. Lloyd Warner of the University of Chicago for his teaching and guidance in the study of social stratification, and to Profs. Daniel A. Prescott and Robert J. Havighurst for orientation in the field of human development. Adapted with permission of the American Council on Education.

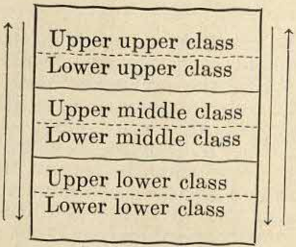
People always recognize their social class, whereas they seldom know their economic class. In both Yankee City and Old City, individuals recognize their class members by characteristic traits, ranging from dress and speech to education and family connections. Class distinctions are always made on the basis of possible social intimacy, as in the following typical expressions: "They go around with our friends." "We don't go around with those people. They don't fit in with our group." "I know I can't class with the big shots." "They are ignorant people, and we don't have anything to do with them." Social classes are thus operating in our society as groups, between which there is no intimate participation.

The sociologist identifies these groups and describes the forms of behavior which their members have in common. It is the community itself, however, not the sociologist, which classifies the inhabitants into social levels and gives each family its class status in this ranking. Social class is of the society's making. The people of any community ask only one question to determine an individual's class position, *viz.*, "*Whom does he associate with?*" The answer to this question places the individual in the social hierarchy. The reader may determine his class position by applying the same test to his own participation. In the social-class system of our society, therefore, persons are recognized as having equal status and as occupying the same position in the social hierarchy *when they can associate freely together.*

In the process of interviewing members of the various classes, the research workers learn that these classes are ranked in the society and that the members of all classes agree upon the relative status of each class. For example, all people in the society admit that the upper-class families have "higher" status, privileges, and symbols than those of lower middle class. Usually these evaluations are expressed in the form of deferential or condescending behavior or in the form of hostile comments upon "the big shots," "the worst class of people," "the nobodies," "the strivers," "the ne'er-do-wells," and by other such phrases.

The crucial tests of class position are certainly the same all over America, in both white and Negro society. People are of the same class when they may normally (*a*) eat or drink together as a social ritual, (*b*) freely visit one another's families, (*c*) talk together intimately in a social clique, or (*d*) have cross-sexual access to one another, outside of the kinship group. These relationships are the basic privileges of class equals; it is to limit the range of such contacts that the class pressures are exerted.

Class Structure.—The study of social participation in Old City and Yankee City revealed three major participation levels or classes. For convenience, they may be termed "upper class," "middle class," and "lower class." Within each of these large participation ranks, moreover, there were subclasses whose members did not associate in intimate relations with those of other subclasses. For example, the *middle class* in a small city has at least two levels, *i.e.*, "the upper middle class" and the "lower middle class." Likewise the *lower class* recognizes distinctions of rank between "the upper lower class" and "the lower lower class." (In a large city, the number of subclasses is greater.) For a small city, the ranking of these social-participation classes may be symbol-



Diagrammatic representation of the ranking of social classes in a small American city.

ized by the accompanying diagram, in which the arrows indicate that it is possible for an individual to change his class position by changing his social participation.

Intimate relationships are made concrete and attainable for the individual by his *social clique*, which is the smallest class unit. The reader's own clique, which is composed of himself and his most frequent associates, may number less than 10 people, but it may contain as many as 30. Social cliques are the steps in the ladder of social rank. A man's status is judged "by the company he keeps," *i.e.*, by the rank of his clique. The rise of an individual in the white or Negro class structure consists in his "getting to know" a very small group of people (a clique) which is just above his own social position.

This smallest class grouping, the clique, which may appear somewhat unimportant at first, nevertheless deserves our closest examination. *For it is the members of the child's and his family's cliques who actually constitute that "social environment" of which we have talked so loosely and which reinforces the child's habits. Through the demands and pressures of the family and of the clique, class learning in instilled and maintained.*

The most basic differences in habit formation between adjacent social classes are those between *lower class* and *lower middle class*. The patterns of behavior in these two groups, in either the white* or the Negro population, are so widely different that it is the common practice, even of sociologists, to speak from their middle-class point of view of the lower class as "unsocialized." The social expectations and available goal responses of lower-class and lower-middle-class people are separated by a virtual chasm which is maintained by taboos upon participation across class lines.

The chasm is a behavioral one. It lies between the stimuli and goals of the "respectable," status-bound lower middle-class and those of the recalcitrant, impulsive, and physically aggressive lower class. The ineffectiveness of the usual middle-class stimuli upon lower-class people and the resultant waste of potential social and economic energy in the lower class are the perpetual concern of middle-class and upper-class legislators, social workers, and educators.

Class Learning.—By defining the group with which an individual may have intimate clique relationships, our social-class system narrows his training environment. His social instigations and goals, his symbolic world and its evaluation are largely selected from the narrow culture of that class with which alone he can associate freely.

A child's social learning takes place chiefly in the environment of his family, his family's social clique, and his own social clique. The instigations, goals, and controls of both the family and of the intimate clique are a function principally of their class ways, *i.e.*, of *the status demands in their part of the society*. The number of class controls and dogmas which a child must learn and struggle continually to maintain, in order to meet his family's status demands as a class unit, is great. Class training of the child ranges all the way from the control of the manner and ritual by which he eats his food to the control of his choice of playmates and of his educational and occupational goals. The times and places for his recreation, the chores required of him by his family, the rooms and articles in the house which he may use, the wearing of certain clothes at certain times, the amount of studying required of him, the economic controls to which he is subjected by his parents, indeed his very conceptions of right and wrong, all vary according to the social class of the child in question.

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* For an analysis of child training and family relationships in the white social classes, see Davis, Gardner, and Gardner (1), Chaps. IV, V, VI.

Our knowledge of social-class training and of the biological and psychological differentials in child development as between class environments is now sufficient to enable us to say that no studies can henceforth generalize about "*the* child." We shall always have to ask, "A child of what class, in what environment?" Very few of the statements which one might make concerning the physical growth, the socialization, or the motivation of lower-class children, for example, would hold for upper-middle-class children, even in the same city.

Class ways in child training, as well as the class-motivating factors in the child's social learning, differ sharply even when the observer considers only the classes having low status. The social instigations and goals of the *lower middle* class, for example, are fundamentally unlike those of the *lower* class. In education today, the ineffectiveness of middle-class sanctions upon the great masses of lower-class children probably is the crucial dilemma of our thoroughly middle-class teachers and school systems. The processes underlying this failure are not yet clear, but it seems probable from life histories that lower-class children remain "unsocialized" and "unmotivated" (from the viewpoint of middle-class culture) because (*a*) they are humiliated and punished too severely in the school *for having the lower-class culture* which their own mothers, fathers, and siblings approve, and (*b*) because the most powerful reinforcements in learning, *viz.*, those of emotional and social reward, are systematically denied to the lower-class child by the systems of privilege existing in the school and in the larger society.

The culture which the child brings to school with him has been instilled by the class environment of his family and his intimate associates. Except in the case of status-striving families and children, this culture is maintained by this same class world, undergoing relatively slight modifications from classroom instruction. In the middle-class family and environment, it is true, the teacher meets support for her methods and goals in child training. If she is to pit herself against the lower- or upper-class child and family, who are from a quite different culture, however, she and the school administration have need for socially more skillful methods and less ethnocentric, middle-class bias (with regard to manners, aggression, and recreation) than they now reveal.

If, when he comes to adolescence and early manhood, an individual attempts to rise above the class of his family, he must learn new class habits and goals from a *social clique* whose members are already in the higher position. A person cannot learn the behavior necessary for an upper-class individual if he lives in a middle-class family because his parents and their clique will not know the habits and demands of the upper class. It is precisely because the family and its clique can teach the child only the behavior of their own class that most individuals are unable to change their class position even in the course of a lifetime.

The individual who does rise into a class above that of his parents must be willing to take severe social punishments. If he is sufficiently aggressive to put himself in this long and painful learning dilemma and sufficiently skillful to discriminate among class goals, he may become upward mobile. But the people in the position just above him will make persistent efforts to keep him in his "place."

It will therefore repay us to look more closely at this social "great divide" as it appears in Negro society, focusing our attention upon the training of children in these class positions.

Social Class in Negro Society

General Characteristics.—Among lower-middle-class Negroes in New Orleans and Natchez, the family is based upon legal and continued marriage. Sexual fidelity is strictly required of the wife. If the husband has extramarital relationships, they must be outside of his normal class relationships and well concealed, or he will be severely punished both socially and economically. The husband works as an artisan or as a white-collar employee in the lower income brackets. While the children are small, the wife seldom is employed. She and her husband are usually grammar-school graduates, subordinate officers in the church and lodge, and members of social cliques and clubs composed of other lower-middle-class people.

Lower-middle-class parents exert a powerful and continual pressure upon their children to study, to repress aggression at school, to inhibit sexual impulses, to avoid lower-class playmates, to attend Sunday school regularly, and to avoid cabarets, night clubs, pool parlors, and gambling houses. They set before their children the goals of a high-school education, a skilled or white-collar occupation, and a "good" marriage.

The child who lives in lower-class Negro society, and more than three-fourths of all Negroes are of the lower class, is surrounded by people of quite different habits who make other demands and set other goals before him. His parents are very likely to separate several times during his life. Extramarital partnerships are common for both husband and wife. Fighting with fists and knives occurs within most families and is common in their cliques and their neighborhoods. Gambling and magic are accepted class ways. Church services are held not more than twice a month, and attendance is casual. Lower-lower-class families in the urban South belong neither to a church nor to a lodge. The ministers and deacons preach the class ways, confining their ethics to warnings against dancing, card playing, Sunday baseball, and "too much" science and education. The parents have attended only a few grades in school, and the educational goal they set for their children is not much higher than their own. In general, lower-lower-class parents hope that their children will complete grade school (six grades); upper-lower-class parents hope for the completion of junior high school (nine grades). Illegitimate birth runs from one-fourth to one-third of all lower-class births; delinquency is far higher than in the lower middle class, and school retardation is almost universal. Within the lower class itself, there are status differences between upper- and lower-lower-class people upon the basis of economic behavior and church and lodge participation. In their habits of aggression, sexual behavior, recreation and etiquette, however, all lower-class people are sufficiently alike so that their habits as a group may be compared with those of lower-middle-class people.

In considering the Negro child of either class in his concrete training environment, there are three useful questions which one may ask: (*a*) What do his parents want to teach him? (*b*) What methods do they use for teaching him? (*c*) What do they actually succeed in teaching him?

Lower-class Training. *Parental Demands.*—Like parents of all classes, lower-class people wish their children to learn the fundamental controls upon eating, disposal of excreta, and masturbation. They also enforce the universal American taboos against open preferences within the family, sex relations with close kin, and violations of age restrictions. In addition, they try to teach the child not to lie to, or steal from, his parents; not to steal from his schoolmates or teachers; not to stay away from school when sent by the parents; not to fight white people unless attacked, and not to be arrested by the police.

But with regard to sex, education, recreation, and aggression toward other Negroes, the parental demands of the lower class are unlike those in the other classes. This is by no means to say that no attempt is made to train the child in these fields, but rather that lower-class society has a standard of its own in these matters.

Training Methods.—In their efforts to teach, lower-class Negro parents punish their children with great energy and frequency and reward them seldom. They cannot offer the more effective status rewards to their children because both economic and educational privileges are class-bound, and there are very few to which the child in the lower class has access. The chief reason for the relative lack of socialization of lower-class children seems to be that their incitement to learn, which means in part to renounce direct impulse gratification and to build up more complex habits and skills, is crippled by the scarcity of available rewards. There must be a push behind human beings to make them learn, and this push is most effective when it not only punishes undesired actions but also rewards the constant effort required to build more effective habits.

A lower-class boy in Natchez, fifteen years old, tells the interviewer that he has failed the fifth grade twice. "Every time I gits home from school, my papa say I ain't goin' to be nothin' nohow, but he whips me jes' the same." His father not only punishes his failure to study but he also withholds the spur of ultimate reward, of higher position, *i.e.*, of "being somebody." The son points the behavioristic moral, "I tells him I ain't goin' to be bad in school no more when he's hittin' me, but that don't do no good, seems lak. I comes right back, an' do's it agin."

The source of discipline in a lower-class family changes frequently from mother to father, to aunt, to grandmother, to uncle, or to an older child. But whoever the disciplinarian at any given moment may be, he is certain to believe that the way to make a child learn is to beat him. Locking the child in the house or withdrawing his play privileges may be used, but whippings are inevitable no matter what other forms of punishment the child may have to suffer. A lower-class mother in New Orleans says of her son of thirteen, "He went out when I told him not to. I tried to choke his neck off when I got him." Equally typical was the woman who said of her son, "I can't understand why he is so bad. I licks him all the time." The mother of a fifteen-year-old boy who, like all his clique members, had been arrested several times for stealing, said that the only "satisfaction" she got for his disobedience to her was "beating on him." Another boy showed the interviewer two scars on his face which his uncle gave him as a child. One of the most conscientious mothers known to the interviewers was a lower-class woman who said that she whipped her son "all the time" when he was a small child to make him obey her. Nevertheless, the boy at the age of thirteen would not attend school, lied to his mother, and stole from stores. The mother put him in a home for delinquents because, she said, he could be whipped more regularly there after each infraction of the rules.

It seems clear, however, that a child cannot be trained in this fashion to undergo the long periods of renunciation which the middle-class ideal of socialization demands of him. If a parent wishes to teach a child to save money, the parent must not only try to prevent him from buying candy or a toy whenever the impulse seizes him, but also constantly tell him what more desirable object (a train, a doll, a rifle) he *will* be able to buy in the distant future with his savings. And this day may not be postponed indefinitely;

the child must occasionally be reinforced in his saving by being allowed to take part of his hoard downtown to buy a doll or rifle.

As a child grows older, the effective learning rewards are increasingly those of status, those associated with middle-class and upper-class privileges and dominance. In this class setting, reinforcements are of long range and learning is driven by powerful anxiety. To have his teachers whip him when he fights on the streets is not an effective control upon a lower-class boy because he knows, by seeing and being a part of life in his position, that he is not going to be rewarded if he is a "good little boy," if he leaves girls alone, or if he studies his lessons. The long-range goals do not seem to be "there" in his world; he does not see other people in his class attaining them or practicing the behavior required of him, and he feels his parents and teachers are "crazy" when they demand it of him.

Strange as it may appear on first sight, his learning reinforcements are weak also on the side of punishment. He is whipped severely but not at the right time. If punishment is to be effective in reinforcing the avoidance of an action by a young child, it must be administered immediately before or after this action. The child is thus taught exactly what acts will be painful to him and that the pain will always be an integral part of this action sequence. But the lower-class mother is usually not able to punish the child promptly or to prevent his repeating the behavior because she is at work. The child makes the goal responses and is reinforced in the habit. If his action is reported to his parents, their tardy punishment does not break down the habit. Furthermore, the lower-class child spends most of his time out of the home—in the streets, theaters, or beer parlors—where his parents cannot observe his behavior and where he is reinforced by the approval of his clique.

Child Learning.—What behavior do the great masses of colored lower-class children learn in this situation? What habits do their parents actually succeed in teaching them? To begin with, the parents drive in the feeding, cleanliness, and masturbation training as rigorously as do middle-class and upper-class parents. It seems certain from our records of child training that these early controls upon the child's use of his erogenous zones are equally effective in all classes and that the rigors of this training give rise to the same kind of personality strain.

With regard to the later sexual, aggressive, and more complex training, however, both the aims and the results differ as between the lower class and the lower middle class. Lower-class Negro children grow up to be fighters, cutters, and shooters, and they are reinforced in this behavior by their parents. They live in a part of the society which is largely outside of the protection of the white law. The parent tells the child to strike out in defense of his body and to be certain to strike first. (In lower-middle-class families, on the other hand, the parental instruction is the same as the court's: "When anybody hits or damages you, come and tell *me*.") It is worth our while to examine for a moment the instruction of our lower-class parents on aggression. Each statement given below is from a different parent.

"Sure, my children fight. I told my married daughter to take a gun to that nigger she's married to, if he bothers her again."

"I tell John to fight anybody his size or bigger. If he can't beat them, I can. A man hit him the other day, and I went out after that nigger with a broom."

"A girl hit Rose at school de othuh day. I went to de school and got Rose and dis girl togethuh, an' I tol' Rose to pick up a brick and hit dat gal if she bothered her again, an' I'd help her."

"I tells my children to fight it out."

"Gerald fights a lot. But he takes that after me. When I was goin' to school, I'd fight all the time."

"I tell Ernest to fight back, an' ef he don't, I'm gonnuh beat him myse'f."

Within the family itself, lower-class children see their parents fighting and begin to take part in these battles as they grow older. A girl of sixteen told the interviewer how she learned to curse her father. "My papa used to cuss at us all the time when he'd get mad. I didn't start cussin' him till the time he began beatin' on my mamma. All of us jumped on him, and beat him up. He was cussin' us, an' we cussed him back. An' ever since then I say anything that comes in my mind to him." In Natchez, a lower-class boy "took a gun to" his father for beating his mother. In a New Orleans family, the children used a hatchet and a gun, as well as their fists, against their father. Another lower-class adolescent, a colored Creole, said, "My father is a war-horse, an' my mamma is pure hell. She'll crawl (fight) anybody any time. You see I come by my fightin' natural. The ol' man an' ol' lady used to fight anybody who jumped on us, an' if we didn't fight, they'd whip us themselves."

If he does not fight when challenged, a lower-class child is punished both by his family and by his clique. If he is a ready fighter, on the other hand, he wins prestige and deference from his clique and approval from his parents. From the middle-class point of view, it seems strange that the pain of being hit or cut does not deter the lower-class child from overt aggression. Two facts which have previously appeared in our case histories must be kept in mind, however. First, a lower-class person becomes habituated to receiving blows and learns that they are not likely to prove fatal or even serious. This is not an anxiety-producing experience, for anxiety develops only in the face of a punishment which an individual considers overpowering and before which he feels himself helpless. This is the situation with middle-class children who are taught that overt aggression is extremely dangerous from the point of view of both physical survival and social acceptance. They are therefore intimidated with regard to making and receiving any physical attack. Their anxiety on this score is generalized, furthermore, to a great variety of "dangers" which never occur and which really do not exist as physical threats at all. But the lower-class child learns, by receiving blows and cuts, that they do not kill and that his part of the society will not "declass" him for fighting back.

In the second place, the pain of physical conflict is a very weak deterrent for the lower-class child because it occurs in a sequence of actions which also lead to the basic goal responses of rage and of hitting. To express violent anger is a tremendously gratifying and cathartic experience. In its end form of hitting, aggressive behavior is a basic goal response and one which middle-class and upper-class people learn to inhibit only at the expense of great strain and anxiety. The necessity of continually repressing the aggressive impulses is a conflict which lower-class children escape. In order to give a blow, they learn quite early to be willing to take one. The really effective reinforcement soon comes to be that of hitting or cutting the person who attacks or frustrates you. This basic, though primitive, reaction, which is deeply rooted in the impulsive nature of all men, is strengthened in lower-class people by the social approval of their family and cliques. For this reason, the lower-class person, unlike the lower-middle-class individual, does not have to endure in his class world the feelings of incoherent rage and helplessness which result from the chronic suppression of aggressive impulses.

With regard to the sexual goal responses, the lower-class child finds his class ways equally permissive. It is true that his parents warn him against sexual relations before adolescence, but at the same time they present him with an example which is just the opposite of their precepts. He observes that their own extramarital behavior is not punished and he learns at an early age, therefore, that there are no serious penalties in his class for sexual exploration. He discovers at a later age, furthermore, that his white employer will not discharge him if he is sexually promiscuous with Negroes.

Parents know that the sexual impulses are deep laid and persistent. Middle-class and upper-class parents throw the whole weight of their power against sexual exploration by their children. In the lower class, on the other hand, the average mother will live with several men during a child's life. The father, mother, and grandmother will almost certainly have extramarital affairs. The mother is usually at work, furthermore, and cannot prevent the sexual play of her children, nor their excursions to cabarets, deserted lots, and dark lanes. Most of our lower-class adolescents were able to "stay out" at night until eleven or twelve o'clock, and many of the girls frequently stayed at cabarets until three or four o'clock in the morning. Almost invariably, a lower-class girl is taught that a man is not to be regarded as a provider and status anchor, but as an object for exploitation. "I tells my girls," a lower-class mother in New Orleans reports, "don't hear what no man say, but see how much he got."

Since lower-class parents know that the road to sexual gratification will be an open one for their children, they instruct them early in matters of pregnancy and sexual diseases. The middle-class interviewers learned, to their astonishment, that most of our lower-class children had been provided by their parents with "books" on sexual matters. Unlike the dangerously uninformed and intimidated lower-middle-class children, they had an exact and detailed knowledge on these points. Their mothers informed them early and warned the girls specifically against the methods of sexual approach by men. But precept, as they often complained to the interviewers, could not take the place of supervision.

Nor could this factual instruction of children on sexual behavior counteract the daily example of parents and clique members. If there are no rewards and punishments in terms of status for inhibiting sexual impulses, people will certainly seek sexual responses. In the lower class, status is not lost by sexual exploration. In the child's clique, for example, sexual gratification is general and approved. In the typical lower-class clique of one fourteen-year-old girl, there were six boys and eleven girls. In the majority of these families, the mother had taken another sex partner without losing status in her own clique. Seven of the eleven girls between the ages of thirteen and seventeen had been pregnant or had borne babies before they had been married. This fact did not injure their position in their churches or in their cliques. A lower-class boy of fourteen in Natchez reported that, in his clique of girls and boys between the ages of fourteen and sixteen, sexual intercourse was common. They discussed this relationship freely in cross-sex groups, he said, and when they gathered in the bayou, a boy and girl would slip off from the group into the woods and nobody would be "'shamed" of this behavior; *i.e.*, nobody would be denied membership in the group or socially punished.

But if a lower-class adolescent attempts to associate intimately with lower-middle-class boys and girls, the first change in his habits which his new clique requires is in sexual behavior. In the lower middle class, sexual exploration by the adolescent is punished by both his clique and his family. One of the girls in our study who was attempting mobility into the lower middle class, was constantly warned by her mother to resist the sexual approaches of boys. "I want to raise her," the mother said, "so she'll be able to get a nice husband." The girl steadily refused to have sex relations with men, and her level of class participation rose just as steadily. She was courted by even upper-middle-class men and became engaged to one young man of this position. She explained to the interviewer, however, that she was "only going out with him to get in society." During this process, the sanctions of the lower middle class were internalized in the form of anxiety concerning sexual relations. The student continually stated that she was afraid to have sexual intercourse because "I don't want to have a baby, and the baby won't have a name. No, not me."

There are two crucial reasons for the effectiveness of lower-middle-class restraints upon the sexual, aggressive, and school behavior of children. The techniques of training which parents use are (*a*) constant, detailed supervision, and (*b*) threats of loss of status if the child is not a "good" boy or girl. Parents know the effectiveness of these training methods quite well; they likewise know the constant danger of the impulse demands. They therefore maintain a solid front with teachers, church leaders, and members of their own cliques, all of whom are recognized as legitimate supervisors of the child.

Lower-middle-class Training. *Parental Demands.*—In the Negro lower middle class, as contrasted with the lower class, a child is a member of a permanent family group and has strongly sanctioned obligations to all members of his immediate family. The father is almost invariably present during the child's early life and he is the ultimate authority in the family. From the age of five or six years, the child is made to attend school regularly. His report card is carefully examined by the parents; punishments and rewards are steadily maintained to ensure good marks and deportment in school. The child is sent to Sunday school and later to church and is required to say his prayers each night. His recreation and play are supervised and his clique members directly or indirectly selected for him, even into the period of adolescence. The lower-class children in his neighborhood are kept at a distance by his parents, and any lower-class clique to which the child may have become attached in the public schools is tabooed by the parents long before the child reaches adolescence.

Training Methods.—Within the family, supervision of the child's play, work, and recreation is chiefly in the hands of the mother, but infractions of discipline are punished by the father. Whipping is very rare; a child is usually punished by being "kept in the house," forced to miss his club meetings, or denied his weekly trip to the movies. In moments of open revolt, he is threatened with loss of economic support, a punishment which entails loss of education and other status supports. "You can't do that and live in my house." "If I tell her I won't go to school, she'll tell me to work, or starve." From his earliest years, the child is trained to be an obedient, respectable, "nice" child. As he comes into adolescence, the anxiety arising from this training is usually sufficient to maintain his lower-middle-class habits. The secret of the "goodness" of the children of this class, as compared with those of the lower class, is largely in the continual early supervision to which they have been subjected. If one attempted to state quantitatively this class difference in training, one would probably be justified in saying that the average lower-middle-class mother is actually in the company of her young child 12 hours a day, whereas the lower-class working mother, who goes to work at six o'clock in the morning and stays until eight or ten at night, is with her child only one-sixth as long. The difference in training can be most clearly stated as follows: the mother in the lower middle class is able to enforce her demands upon the child 50 times a day, let us estimate, whereas the lower-class mother is able to punish or reward her child's actions only 8 or 10 times a day. One of our lower-middle-class boys expressed the constant supervision which his mother exerted over his behavior by saying, "Mother is always anxious for us not to get in any trouble" (*i.e.*, to be "good" children). His mother gave a detailed account of her training demands, including the rule that the boys should not leave their neighborhood after school hours nor leave their yard after dark. "Bend a twig while it is young," the mother stated, in explaining the "good" behavior of her son.

Overt aggression was universally punished by the parents of the Negro children interviewed in the lower middle class. Fighting and cursing are among the few actions for which a child is whipped. A typical comment from children in this class was, "My mother don't allow us to fight or curse. She got that out of us early." Children in this position are even more severely intimidated with regard to sexual behavior. Most lower-middle-class parents maintain an awful and complete silence on this subject except to make terrifying threats concerning masturbation and to punish severely and without explanation any form of sexual play. Sex is made to appear horrible and extremely dangerous; it is a form of feeling and action which is so reprehensible that even one's own parents cannot mention it.

The result of this training, as seen in our middle-class children, is to make them bear a severe burden of anxiety concerning their sexual impulses and responses. They are afraid to talk of their sexual life to parents or teachers, afraid to have intercourse, terribly ashamed and humiliated by their masturbation, afraid that having a baby will kill them, and convinced that all sexual behavior is sinful. This is the price which middle-class people must pay in order to maintain their class position and to make a good marriage.

As yet, the lower-middle-class society knows only one way to train a girl to make a "decent" marriage. In order to make her stay in school and keep her "reputation," her parents block the road which leads to sex. If it is made optional whether she is to undergo the renunciations necessary for "respectability" or to follow the sexual urges, parents know well that the constantly stimulated sexual impulses will usually win. One must therefore block this road by punishment and anxiety. Soon the child begins to be rewarded by his clique and class members for inhibiting sex. The girl learns to act on this basis, "If I wait, if I work and refuse to have sexual intercourse, then I can look forward to the fine day when I shall get a good husband and be married in a church."

Child Learning.—From the standpoint of the dominant classes in our society, she would then be a good child. The serious difficulties of educators, ministers, statesmen, and social workers are not with people of her class. Her family and their class members are the very backbone of Negro society, as their white counterparts are of white society. They are the "poor but respectable" people, "the decent poor," whose motivation to work hard, to sacrifice their own gratifications for their children's training and education, and to safeguard the monogamous family, is deep and vigorous.

If one wishes to know how they became decent and moral, in this sense, how they developed these strong habits of impulse renunciation and status striving, one must turn his attention to a very commonplace but little-appreciated fact. The lower-middle-class child is systematically prevented by his parents from exploring the society around him. His learning is supervised so that he will experience only certain goal responses. His resultant habits are maintained by the sanctions of the status structure in which he lives. Whereas the lower-class child is usually a "child of the streets," able to explore the life of the streets, the beer parlors, the cabarets, and the free world of sex, the lower-middle-class child's random, exploratory behavior is checked by his parents and their clique, and by his teachers. His parents even tell him what movies he may see and what magazines he may read. He must be present at mealtimes and he must be in bed by eight or nine o'clock on school days. His parents always know where he is and what he is doing until he is well into the period of adolescence.

The degree of supervision by parents increases still further and the class range of the child's play group narrows steadily, as one moves into the more privileged classes. Mothers are less frequently employed; they have fewer children at wider intervals and can therefore train them more carefully; and the child's friends are selected from a smaller circle of acquaintances. As one of our upper-middle-class boys, thirteen years old, said, "My mamma doesn't want me to go anywhere. Just to school, and play in front of the house." His mother explained her training methods in brief, "If you let up on them, they'll start going the wrong places and doing the wrong things."

By restricting the child's associates to the children of their own friends, the parents narrow the circle of supervisory adults and thus lessen the chances of his exploring new types of behavior. The child is kept so close indeed in many upper-class families that his intimate associates may be counted on the fingers of one hand and are largely restricted to his own kin.

At the same time that the child of higher class position is supervised by his parents so as to prevent his making the impulse goal responses, he is also reinforced by them in all those actions which lead to the gaining of prestige in school. His position also differs from that of the lower-class child in the models of identification which it offers him. He sees the deferential treatment which his parents and their clique members obtain from lower-class people, as well as from teachers. By observing the social rewards which they receive and the social punishments which they avoid as a result of their status, he is reinforced in forming those habits of school learning which lead to status in the school society. In order to understand the desire for prestige in children in these higher positions, we must visualize the social punishments and resultant anxiety which loss of status involves. It is this anxiety, systematically maintained by his relationships with parents, teachers, and cliques, which drives the child toward the status goals. Once he experiences dominance relations with his schoolmates and diminution of anxiety as a result of his successful learning, he is reinforced in all those acts which have led to the gaining of these goal responses. His striving for the prestige goals then becomes more constant.

Educational Implications.—In order to motivate the great masses of lower-class children who crowd our elementary and secondary schools so that they will learn the educational and technical skills, the sexual and aggressive controls, and the manners which will enable them to gain higher privileges and greater social and economic efficiency, educators must first know lower-class culture and understand the instigations and goals of the lower-class child. If these old habits and reinforcements of the lower-class child are to be replaced by new learning which will enable the school to recruit the child into the middle-class way of life (with an attendant increase in the social and economic efficiency of our society), the school must (*a*) remove the class punishments from the lower-class child within the school society and (*b*) concretely reward his tentative striving for prestige in the school community. The striving which the middle-class pupil exhibits is driven by socially adaptive forms of anxiety, learned in his class world. As yet, it seems, our society must depend upon this process for maintaining the long-range instigations which effective socialization in the high-skill roles demands. In order to reinforce the lower-class child in such striving, the teacher and social worker must learn to reward him. To be capable of this type of education, they must be able to view their own middle-class status and culture with a wholesome degree of objectivity.

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CHAPTER XXXV

THE HOPI CHILD*

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Introduction

That studies of the child in primitive societies have much to offer to our knowledge of child behavior and child development has been recognized for a number of years. This point of view has been emphasized particularly by Margaret Mead, whose own contributions to this field are most outstanding. The bibliography appended to this chapter indicates the extent to which there has been an increased interest in the primitive child in the past decade.

Primitive societies are of great value in the study of human behavior because they present such a variety of social conditions. In contrast to the modern nations of the world, all of whom tend to share the same cultural background, primitive groups, on account of their relative isolation and their manifold cultural histories, display a much greater diversity. There are present in primitive societies many conditions which could not be imposed experimentally by psychologists in our own culture, as variations in the kinship system and in the social roles of the two sexes. Primitive groups, therefore, offer a supplement to the experimental method which can be obtained in no other way.

In view of these facts it would seem that when an investigator is faced with the problem of the effect upon the child of some experimental variable which it is not practicable to impose upon the individual in our own society, he should be able to turn to some primitive society for the answer. However, in order that the investigator may be able to refer to the appropriate society, there must be available to him an account of the methods of child care and of child training in each of a large number of primitive groups. This knowledge we do not have at the present time, since child care has been studied adequately in only a few groups.

The immediate need, therefore, is for more extensive information concerning child care in diverse cultures. Our study of the child in an American Indian group was conducted in order to add one further culture to the small list of those whose child care has been described.

Upon reaching a decision to conduct a study of the child in an American Indian culture, we cast about for a suitable group upon which to direct our attention. We wished to select a society which had maintained to the greatest degree its aboriginal condition. Upon good advice our search soon became centered upon the Southwest as an area in which primitive groups still live in a fashion quite similar to that of their pre-Columbian ancestors. We chose the Hopi, who live in a dozen small villages in northern Arizona, as probably having been the least influenced by their white conquerors, both Spanish and American.

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* This chapter is adapted from an extended study by the writer (1) with the permission of The Institute for Research in the Social Sciences, University of Virginia.

In studying the care and the behavior of the Hopi child, our aim was not to formulate a set of problems and attempt their answer, for, as we have indicated above, this approach cannot be made unless details of child care are known in advance. Many of our data, therefore, are not specifically related to current problems in child development, although they may be of utility at some later date. On the other hand, some of our data are relevant to problems which are clearly posed at the present time, and occasionally in our presentation we have briefly commented on the bearing of our data upon these problems. Our data bear more directly upon problems in the development of the young infant than they do upon problems of later childhood.

Our observations were made during the summer months of 1937 and 1938. During these periods we (Mrs. Dennis, our daughter Mary, and myself) lived in a native house in New Oraibi. In consequence, a great deal of our observational data refer to behavior seen in this village, which is the most Americanized of the Hopi towns. The facts will show that this Americanization is not pronounced.

By working with informants, we obtained much information concerning Hotavila also. Since Hotavila is probably the most conservative of the Hopi pueblos and most unfriendly to outsiders, we did not find it feasible to live there. We were fortunate, however, to find admirable informants who were residents of Hotavila with whom we could work in privacy outside of the village. Our information comes primarily from the two villages just mentioned. In addition, some data were secured relative to Mishongnovi.

In presenting an account of the behavioral development of the child in an Indian pueblo, we shall divide our material into two main parts. Our first task will be to picture the world which surrounds the individual who is born into Hopi society. Later we shall try to show how the Hopi child behaves as he faces his cultural milieu.

Hopi Child Care and Training*

Treatment of the Newborn.—Very little is done by way of preparation for the birth of the infant. The wardrobe of the newborn is scanty, and since it consists only of blankets, cloths, and rags, it requires no special attention. As soon as the infant is born, the doors and windows are covered over with blankets, because light is thought to be harmful to the infant during this period. As soon as the busy attendant has an opportunity, the infant is "cleaned" as follows: First, ashes are applied to the baby. The ashes are derived by burning sagebrush. Following the application of the ashes, the baby is bathed in yucca suds and warm water, the suds being made by shaking a piece of pounded yucca root in a basin of water.

The infant is then wrapped as follows: He is placed on a blanket. A piece of cotton cloth is placed over his chest and passed between the chest and the arms so that the arms will not be brought against bare flesh of the body. Rags are placed under the buttocks and between the legs. Nowadays diapers are sometimes used in place of the rags. Then one side of the blanket is brought over one arm of the infant and passed between the chest and the arm of the opposite side and tucked under the infant's body. The other side of the blanket is passed over both arms, which are extended along the body of the infant, and it too is tucked under the infant. Thus wrapped, the infant is placed upon the cradleboard.

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* The following description refers specifically to the practices of Hotavila. Other Hopi villages conform to most of these practices, but there are some local variations. Hotavila has retained more of the old customs than have most of the other pueblos in the Hopi group.

The old cradles were woven from pliable twigs of native shrubs. These woven cradles have now been largely replaced by a board cradle because the latter is more easily constructed. The board cradles, however, retain the traditional shape, as does the face guard, which is now commonly made of wire.

The baby is bound to the cradle during the first day. This is done by lacing strings (formerly buckskin thongs) through holes provided at the side of the cradle or by tying strips of cloth around both child and cradle. The ties are passed over the legs also, so that the legs can be flexed only slightly. The purpose of this binding is to ensure that the infant will be straight and of good carriage.

The infant is taken off the cradle only for changing the soiled cloths and for bathing. He is put to the breast and nursed while on the board. When he has gone to sleep, the board is placed on the floor or on a bed. At night, the cradleboard rests beside the mother. When the infant is asleep, a cloth is placed over the face guard, for the purpose of excluding the light, preventing drafts from striking the face, and keeping flies from it.

Infant Care.—The forms of infant care which characterize the first day of life continued throughout most of the first year. The baby is bathed each morning as described although the use of ashes and of yucca is discontinued when the *vernix caseosa* has disappeared.

The cradleboard is employed very assiduously for the first 3 months, the infant being taken off the board only for cleaning and bathing, acts which combined do not occupy more than an hour daily. After 3 months the straightness of the child is assured and the mother may discard the cradleboard whenever she pleases. Actually, its use is seldom discontinued before the child is six months of age, and it rarely is employed beyond the first year of life. The duration of the cradle usage depends in part upon the restlessness of the infant and in part upon his motor development. If an infant becomes restless on the board, he is freed earlier than would otherwise be the case. If he walks precociously he is taken from the board at an early age, for the board is seldom used after the child begins to walk.

The infant is nursed whenever he expresses a desire for the breast. This means that the intervals between feedings are short. In addition to serving the function of feeding, the breast is used to pacify the infant if he is crying for some reason other than hunger.

Babies are petted and fondled, they are placed on the lap, and are carried about. It is believed that the infant should not be left alone, as this would expose him to danger from witches. In consequence, the infant is always in the presence of someone.

The care of the infant during the early months is provided by his mother. Thereafter an older sister of the infant, if there be one, takes over his care to a greater and greater degree. She watches over him, carries him about, and takes him out of the house for a part of the day. In carrying the baby, the older child places him on her back and then puts around him a shawl, the ends of which she holds securely in her hands. The baby is not carried until he is three or four months of age. Before this age, he is not considered strong enough to be carried and so remains at home.

Weaning.—Very few babies are weaned before the end of the first year. Some children nurse even to the age of seven and eight years, but these are rare cases. The most common time for weaning is during the second year. Our informants stated that only a few babies nurse for more than two years, because in most cases the mother is again pregnant within two years of the birth of the preceding child. A child is usually weaned at the beginning of the next pregnancy, but this rule is not invariable. To wean a baby the mother may put powdered red chili on the breast. Another means, sometimes used as a supplement to the first, is to turn the child over to one of his grandmothers for several days.

Toilet Training.—No toilet training is attempted until the child is able to walk and to understand some words. He is then told to go outside when he needs to defecate and urinate. To the beginner, this means literally just outside the door, although older children go to a corner of the plaza and adults go outside of the village. If the child fails to go out of doors at the proper time, he is spanked.

Eating and Sleeping.—The child may come home to eat whenever he pleases and may eat anything that is available. He need not eat when the other members of the family are eating and need not come home at any particular time. A child can be seen with a piece of food at any hour.

As soon as the child can walk, he may go to bed whenever he wishes. The younger children usually become sleepy before the parents retire; the older children often go to bed at the same time as do the parents. Children of six years or older are roused at the same time that the parents get up. A child should not sleep late in the morning; to do so is a sign of laziness.

Obedience.—The child owes obedience to his mother and father, to his mother's brothers, and to some extent to his father's brothers, who are called "fathers."* Grandparents should be respected, but they are not disciplinarians and do not enforce obedience. Young children are almost continuously under the care of older sisters, but the older sibling cannot take punishment into her own hands in order to obtain obedience to her commands. The younger child usually obeys the older child, but in cases in which this does not occur, the older sibling must appeal to the parents. Other people in the village may not command the child, or threaten, or punish the child, but they are free to reprove him for wrongdoing and to report his misbehavior to his parents.

Childhood Prohibitions.—The Hopi child is free from many of the frustrations which are continually imposed upon the modern city child. The primitive child, generally, lives in a much simpler material culture, where valuable objects are more rare and not so easily damaged as are our own. He is surrounded by a minimum of breakable property, and in consequence there is no occasion to tell him not to spill things on the floor, not to pull books off the shelves, not to touch the telephone or the radio, not to climb on chairs or on stairs, not to put his hands on the windows, and not to pull the tablecloth. He escapes a thousand and one other demands which are made upon the child in the American home.

It would be erroneous, however, if we were to conclude that the Hopi child is subject to no prohibitions at all, and we must proceed to describe the things which he is supposed to avoid. The very young child at Hotavila is warned about the edge of the cliff, which borders one side of the town, and which at some places is a sheer precipice of 100 ft., with a very steep slope below the initial drop. He is warned not to go near a fire. The cliff and the fire provide the two greatest physical dangers to the child. He is also warned to keep away from the hatchways which descend into the kivas, the underground ceremonial chambers.

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* For an excellent description of the kinship system, which is intimately related to child training, see Eggan (3).

He should not fight or tease or injure anyone. Other people's possessions should be left strictly alone. Stealing is strongly condemned, and the child is early required to respect property rights. It is important that the child in no way injure the gardens, the fields of beans and corn, and the fruit trees. To talk back to adults is considered bad. However, there are no word taboos except an impolite name for Navaho.

Duties of the Child.—Foremost among the expectations of the Hopi parent is the requirement that the child shall work. The industry of the Pueblo peoples is well known and is a precondition of existence in the arid region in which they live. The child is expected to join in the work of the household, although his contribution is proportionate to his size.

Until he is six years of age, the boy has few duties to perform, being free to play about the village all day long. At about this age he begins to accompany his father to the fields and helps with the light work there. He guards his father's cornfields against prairie dogs and his father's orchards against birds. He also begins to help his father's brothers, who will weave his wife's wedding garments for him when he marries. He accompanies his father, or some relative, in taking care of the sheep and cattle. He runs errands and chops a little wood. When the fruit is ripe he helps to pick it and to carry it, and he also helps with the harvesting of the fields. As he grows older, his work gradually approaches that of the nature man.

The girl's work is a miniature of the tasks done by her mother. One of the girl's chief tasks is to take care of the youngest or next to the youngest child. If the girl is playing, she should return home about the time the baby wakens, and she is responsible for him until he again goes to sleep, unless relieved by someone else. However, she may play while she is looking after the younger sibling, and she often takes her charge to a place where some of her playmates are gathered.

The girl is responsible for helping with the housework. If there are two or more girls, only one is needed to care for the baby, and the younger one is usually chosen for this task. The older girls help in carrying water, in sweeping the floor, in tending the gardens, in shelling corn, and in cooking. The girl also begins to grind corn (this work is done by hand upon stone metates) when about eight years of age; her task in this regard gradually increases. Beyond the age of twelve the girl no longer plays freely throughout the village but is expected to stay at home. The feeling that the older girl should always stay at home is in part prompted by modesty and propriety, but it also results in her contributing a great deal to the work of the household.

Parental Approval and Disapproval. The housing, feeding, and clothing of the child by the parents, and the less tangible services of the parents to the child, create bonds of love and of gratitude and of dependence which are used to influence the child toward observance of the parents' wishes. In some cases the desire to please the parents which grows out of the parent-child relationship may be almost sufficient in itself to cause the child to do what the parents wish in regard to helping with the work of the family and to conform to the family pattern of religion and of deportment. If this is not sufficient, the parents have means of reward and punishment which can be brought into play.

Gifts are sometimes given to reward a task well done or to encourage an interest in work. The boy may be given a ewe, whose offspring will be his if the sheep receives proper care. The girl may have a small vessel for water carrying which is all her own. Other rewards are received from the hands of the kachinas, who are to be described later on. On the negative

American baby. The cradling of the Hopi infant prevents a number of actions which our babies commonly engage in, such as bringing the hands to the mouth, playing with the hands, watching the hands, and putting the feet in the air.

Another contrast between the training of the Hopi and of the white American child occurs in regard to feeding practices. Whereas the American infant is often bottle-fed almost from the beginning, or at any rate is weaned at an early age, the Hopi infant is invariably breast-fed, is seldom weaned under one year of age, and frequently is not weaned before two years. Furthermore, the American infant is usually placed on a rigid schedule of feedings with an interval of several hours between feedings. Often he is expected to cry for some minutes before being fed. The Hopi infant, on the other hand, is nursed as soon as he cries and consequently nurses frequently and cries very little. The breast is used as a pacifier even though the cause of crying is pain or fright and not hunger. Among the Hopi there is no feeling that crying is something to be expected from the infant; because of this there are but few frustrations during infancy and but little adherence to predetermined routines.

There is a great amount of avoidance training for the white infant. The American child, as soon as he can creep, is admonished not to touch radiators, windows, and electric fixtures; not to soil walls, furniture, curtains, books, pictures; and not to handle pieces of property such as spectacles, watches, jewelry, cigarettes, ashtrays, and dishes, which are often left within his reach. We have previously indicated that the Hopi infant has few such prohibitions.

Let us now discuss the outcomes of these differences in child care. One aspect of behavior which undoubtedly is influenced is the frequency with which various infant behavior patterns are elicited. Crying provides a convenient response for a concrete example. The Hopi infant cries rather little. One can be in a village whose arrangement is more "intimate" than that of a modern apartment house and seldom be aware of the babies of the community. The reason lies in the facts just stated; *viz.*, the infant is not denied food when he wants it, is not denied objects which he desires, is not put to bed when he is wide awake, and is not fed when he has no appetite. The "goodness" of the primitive infant, which has often been noticed, issues from the fact that he is not provoked into crying. When such provocation is given, as occasionally it must be, the Hopi infant cries as readily as does ours and cries from the same causes.

Another effect of culture upon infant behavior lies in the fact that the infant in different cultures becomes conditioned to different objects and becomes accustomed to different procedures. An infant who is hungry but who has never been fed from a bottle will not react to the sight of a bottle as does one who gets his nourishment from that source. No Hopi infant would react to the sight of a nursing bottle as many white infants do, because for the former it has never become a symbol for food. The culture determines what shall be symbolic for feeding and what shall be symbolic of each of the many attentions surrounding the infant.

However, the patterns of response of Hopi and the white infant are identical. The Indian infant may not cry so much as the white infant, but the cries are the same. Quite different things may keep the children of the two cultures from going to sleep, but the reactions are not distinguishable. The sleepy infant frets, fusses, tosses, and cries, regardless of culture.

The behavioral similarity of American infants and Southwestern Indian infants needs to be examined in detail, especially at points at which we might expect a difference. One of these is motor development, for we have seen that Hopi cradling customs limit during most of the day the random activity of the infant, force the arms and legs into an extended position instead of the usual flexed position, prevent manipulation of the hands, and make it impossible for the child to rest on the abdomen. Nevertheless, observation of a large number of Hopi infants of various ages shows that the characteristic response patterns are the same for the two groups. In spite of the enforced extension of the legs, the Hopi infant, when freed from his bindings for the bath or for the changing of bedding, takes the usual flexed position. Although his hands are held downward perhaps 23 hours in 24, when he is at liberty he puts them to the mouth and carries objects to his mouth as do white babies. He reaches for objects and handles them at approximately the same time as do white children. He reaches for his toes and puts his toes in his mouth. Sitting, creeping, and walking follow in the usual sequence.

The social behavior of infants is identical in the two groups. The Hopi infant develops social smiling, social laughter, vocalization, crying at strange noises, staring at strangers, and crying at strangers just as does the American infant.

Recently the material of 40 biographies of white babies has been compiled so as to show all the responses which were reported for at least 10 of 40 infants (2). *Every one of these reponses was observed among Hopi infants, and no response was observed among Hopi infants which had not been noted commonly among white subjects.*

Effect of Cradleboard upon Age at Walking.—We have attempted to find the effect of the use of the cradleboard upon one response, *viz.*, the onset of walking, by comparing the records of Hopi children who have been reared on the cradleboard with the records of those who have not been subjected to any restraint in early infancy.

Of the present-day Hopi villages, all make use of cradleboards, except the towns of New Oraibi and of Upper Moenkopi. Many of the parents of the latter two villages have become Americanized to the extent of giving up the use of the cradleboard. Nevertheless, their diet, their nursing customs, and their child-rearing practices apart from the use of the cradleboard remain virtually unchanged. New Oraibi and Upper Moenkopi, therefore, furnish a nearly ideal comparison group for the purpose of contrasting Hopi infants who have not been placed on the cradleboard with those from other Hopi villages where the use of the cradleboard still prevails.

In all, we secured data on 63 children who had used the cradleboard and on 42 children who had not used it. The infants who used the cradleboard and those who did not use it differed in average age of onset of walking by only 0.07 months, the averages being respectively 14.98 months and 15.05 months. This means a difference between the averages of less than two days. The average age at walking of those who used the cradleboard is slightly *less* than those who did not. Since the differences are quite insignificant, there is no evidence of an effect of the cradleboard upon age of walking.

Sibling Jealousy.—We asked several of our informants if children become jealous when a baby sibling is born. The new arrival is usually a surprise to his immediate senior, although the older children are sufficiently acquainted with the signs of pregnancy to have guessed in advance that another baby is expected. Our informants' replies were to the effect that the next oldest child is often jealous of the new baby. He pushes the baby away from the mother, especially when the baby is being nursed. Toys may be taken from the baby by the older child. One informant believed that the child who is only two or three years of age when a sibling is born is especially likely to be jealous of the attention which the mother gives to the infant. Nevertheless, some children do not exhibit jealousy of the baby and may even appear proud of the new member of the family.

Fears.—The young Hopi child displays the same fear of strange objects, persons, and places as does our own. Fear of strange people is common at about ten to fourteen months of age. Clowns and kachinas, since they are very strange in appearance, are often terrifying to a child who has not seen them before or who has not seen them since early infancy. (Clowns and kachinas do not appear between July and February.) Our observations as well as the testimony of informants affirm that the child toward the end of the first year of life is often afraid of these characters.

Beyond the first year, the fears of the Hopi child are usually governed by what older children and adults tell him. He is told of Soyoko, although he may never have seen her. He is afraid of the mythological Owl and Coyote because it is said that they will harm him. These characters are used as bugaboos with which to threaten children who do not behave. He is also afraid of witches, about whose dangerous activities he has been warned.

Tantrums.—The cause of tantrums, according to our informants, lies in keeping the child from doing something which he wishes to do; in other words, tantrums are caused by frustration. Other conditions may be contributory. The child is liable to have tantrums if he nurses when his mother is worried. Tantrums are more likely to occur in hot weather than on comfortable days and are more frequent before meals than after the child has eaten, according to native observation. The reponse pattern in tantrums is the same as among our own infants.

The Direction of Affection.—Despite the fact that because of the Hopi kinship system many women are called "mother" and many men are called "father" the child distinguishes his true parents, and his chief bonds of affection are to them. Aside from his father and his mother, the child seems most favorably inclined toward his father's brothers and sisters. They are interested in the child, they are affectionate with him, they spoil him and give him gifts, but they do not scold or punish him and have no responsibility for him. Those who are responsible for his conduct, in addition to his parents, are his mother's sisters and brothers. We have seen that the mother's brothers play an especially important role in the matter of administering moral lectures and in meting out punishment. On this account, the uncles are usually feared and disliked. They are thought of as "mean" to the child.

In Hopi society the relations between the child and the father on the one hand and between the child and the maternal uncle on the other hand are very similar to the relationships with which Malinowski (4) has dealt among the Trobriand Islanders, and the psychological outcomes of the two situations seem quite similar. The Hopi child shows no fear or resentment of his father, but, to the contrary, is fond of him; the maternal uncle is often feared, resented, and disliked among the Hopi as among the Trobriand Islanders.

An Observational Study of Play Behavior.—The house which we occupied in New Oraibi during the summer of 1938 was a one-room native structure. Fortunately for our purposes it had one or more windows in each wall, and the surroundings of the house were such that by moving from window to window we could obtain a complete view of the near-by section village. Beyond the western end of our residence was a level plot of relatively soft sand, suitable for play. However, one of the chief environmental disadvantages here, as well as elsewhere in the village, was the absence of shade, for there were no porches in the pueblo and practically no trees. Because of the need of protection from the midday sun, we constructed over this sandy space a native summer shelter of the type that is often constructed in the fields.

The shelter, which provided a shady place to play throughout the day, was attractive to children, and it was seldom unoccupied. It was located immediately outside one of our windows. When we were inside our house we could see and hear what was going on in the shelter. We attempted, when we were at home, to observe at least once per hour the play activities which were in progress. Occasionally we observed continuously for an hour or more. Our procedure in such cases was to watch the children about 10 min., then to write down in summary form what we had seen, then to observe for another 10 min., etc. These observations have been published in full in the original report.

Unfortunately there is no record of the play of American children which is comparable to that of the New Oraibi participants in regard to age distribution, the types of play materials which were available, and the relative absence of adult supervision. It is therefore difficult to determine in what ways the play which we have observed may be similar to, and in what details it may differ from, the activities of children of a different cultural background playing in the same immediate environment. Nevertheless some aspects of our records seem worthy of comment.

Proximity as a Determinant of Participation.—Theoretically a Hopi child may play wherever he pleases within the village, but a consideration of the play diary shows that at least so far as our shelter was concerned it was patronized chiefly by children of the neighboring houses.

Conflicts.—It is our impression that in comparison with many groups of American children playing under roughly the same conditions the Hopi playmates got along with remarkably little trouble. During the period of our notes there was not an incident that could be called a serious fight, nor was any child injured more than slightly. There were several conflicts, to be sure, but generally speaking they were of a transient nature.

Age Differences.—When children of two to four years of age were in the shelter at the same time as somewhat older children, there was a marked tendency for the younger children merely to watch the older ones. Na, Ann, Joe, and Ed, who were the youngest of those who came to the shelter, usually sat on the side lines and made no attempt to participate in group activities. The only exception to this rule occurred in the case of the swing, which the younger children were as anxious to use as were the older ones.

Cultural Content of Play.—Many of the activities of the children were probably specific to the Pueblo culture area, and some may be specific to the Hopi. The use of bone dolls we have not discovered in other Pueblo groups, nor do we know that the technique of roofing mud houses by first filling them with dry sand occurs elsewhere. The play rabbit hunts, the threatening of the dolls with the Soyoko, and the modeling of pottery probably take place in most of the Southwestern pueblos.

Fads.—The various kinds of play ran through cycles of popularity and unpopularity even in the short period covered by our observations.

Temperature Effects.—While we do not have enough cases to make for statistical certainty, our observations suggest that the Hopi children were relatively inactive when the temperature was between 90° and 100°F. and were most active on the occasions when the air became as cool as 70°F. It also appears that in summer Hopi children are more active after sunset, when the air is invariably comfortable, than they are in the heat of the day. Both of these deductions from the play notes are corroborated by general native testimony.

A Census of Problem Cases.—In an attempt to find with what success Hopi methods of child rearing operate, we decided to determine roughly the frequency of each of several kinds of problem behavior in the villages which we knew best, *viz.*, Hotavila, New Oraibi, and Mishongnovi. The question of how to obtain a significant record of this sort was a difficult one. To do so by direct observation was out of the question, for no one could attempt to witness personally all tantrums, all instances of lying and stealing, etc. But fortunately for our purposes, information concerning misdeeds in the community is common property. We do not claim that such popular information is always correct, but we feel that it is worth presenting. Whatever the objective truth may be, the testimony of an inhabitant may be said to give a local evaluation of the behavior of the village children.

After we had obtained from an informant a complete list, by households, of the children of her village, we went through the list with her and had her indicate which of the children indulged in each of several kinds of behavior. The types of behavior concerning which we inquired were: thumb sucking, temper tantrums, fighting, and stealing. We made certain in advance that these terms had meanings for our informants which coincided with our connotation. The data referred to conditions as of the summer of 1938, and not to earlier behavior. That is, if a child had had temper tantrums formerly, but no longer displayed them, he was not listed as having them at the time of the census. The complete tabulation of the frequency of these four forms of behavior by sex and age groups is presented in the original report. The data refer to a total of 525 cases.

On two grounds we might expect thumb sucking to be absent among the Hopi. The first of these is the frequent nursing, which might be expected in itself to satiate the drive for oral satisfaction. The second consideration is the binding of the hands of the infant, which might act to prevent the formation of the habit. But we have seen that the Hopi infant exhibits the hand-to-mouth reaction when the wrappings are removed. Beyond the age of six months the child has considerable opportunity to indulge in this reaction, and he frequently does so. We observed several instances of thumb sucking. Native mothers, while they did not consider it to be a serious problem, stated that thumb sucking often occurred and they frequently had recourse to powdered chili in an attempt to cure it. In the census, the habit of thumb sucking was found in one child of nine years of age. Of the children between two and nine years of age, a total of 228, 13 children, or 6 per cent, were definite cases of thumb sucking. This evidence should be sufficient to show that thumb sucking does occur in a primitive society where nursing through most of the second year is the general rule.

Temper tantrums were found to be much more common among boys than among girls as 21 boys and only 7 girls were said to have tantrums. The age range for tantrums was from two to twelve years of age, with the greatest incidence falling in the two- to six-year-old level.

Fighting shows an even greater predominance of boys over girls than do tantrums, the numbers being respectively 22 and 5. The girls who were reported as fighting were between four and nine years of age. Some boys who fought were as old as sixteen, but none was older than that. The greatest incidence of fighters was between eight and fourteen years of age. In this age interval, approximately one-fifth of the boys were said to engage in fights.

In regard to stealing, the boys outnumbered the girls 27 to 15. Beyond four years of age, when the taking of other people's property begins to be considered intentional stealing, there was no consistent trend with age, until the age of eighteen was reached, when the rate dropped markedly.

It should be pointed out that at all ages the children who misbehave form only a small minority. There is a further fact which deserves notice, *viz.*, most of the problem cases come from a few families. It is the native belief, and the evidence supports it, that it is family attitude and discipline which determine the good behavior of the young child. Examination of the means of social control of the child will show that the parents and the maternal uncles provide practically all the important social influences. The control by the kachinas provides no exception, for while the young child does not identify the kachinas with his relatives, they are in effect the same persons.

A few words may be said with regard to the fact that in the census of behavior problems the boys contributed more cases than did the girls. This situation is so much like the condition which prevails in our own very different and quite unrelated society that we are likely to see in it the result of fundamental differences between the sexes. In describing the training of Hopi girls, we noted that during the early years almost all girls have the responsibility of caring for younger siblings. This fact may affect the chances of a girl's fighting with others of her own age and certainly affects her opportunities for stealing, since she has an almost constant younger companion who cannot be trusted to keep secrets. Beyond the approximate age of ten years, the Hopi girl is expected to remain at home almost continuously and to go about only when accompanied by a woman. This persistent supervision of the girl has no counterpart in the boy and renders a biological interpretation of the sex differences in problem behavior very dubious.

Summary and General Discussion

All the kinds of behavior which are treated in textbooks of child psychology are to be found among the Hopi children. Jealousy occurs, and its symptoms and causes appear similar to those of our own children. The tantrums of the Hopi child, also, are like those of the American child in their form and in the circumstances which precipitate them. The two chief kinds of fear in the Hopi child are fear of the unusual or strange and the fear of injury. As among our children, so among the Hopi also, a great many of the fears refer to imaginary dangers.

But there are also *differences* in the behavior of the two groups of children which we are considering. Some of these differences are inescapable outcomes of the two cultures and are so obvious that they scarcely require mention. Hotavila children, of course, do not learn to swim, as there is no water in which they may swim. They do not go to movies, they do not ride in subways, they do not attend church (some New Oraibi children attend church). Other differences, though real, are more difficult to record, and further research will be required if objective evidence for them is to be obtained. The subtler differences between communities of children are probably matters of degree rather than of kind and hence require measurement. It is likely that these differences are primarily differences of attitude, which only occasionally show themselves in overt behavior. The comments which follow should be taken as suggestions for future research rather than as verified findings.

It seemed to us that the minimization of personal power and prestige among the Hopi has its effect upon the younger members of the community. We thought we saw less rivalry than exists among American children and less desire to be important, superior and distinguished.

Another guess which we hazard with respect to the Hopi child is that he has a strong feeling of social security. His is a world which he knows intimately and which accepts him completely. A Hopi is never driven from his village; he is never an outcast; he never starves when others have food; he never lacks a place in which to sleep. He lives in a social world in which he has an indubitable place. He does not face an unknown vocation or an uncertain future, but looks forward to a life which even today is much the same as it was in the past. To determine whether this and other of our impressions are correct will require the application of intercultural methods of comparison which are not available at the present time.

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